

# CAX SAFETY HANDOUT

MARINE CORPS AIR GROUND COMBAT CENTER

TWENTYNINE PALMS CALIFORNIA

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**PURPOSE:** This handbook is for use by CAX exercise force units during TTECG sponsored and evaluated events only. It is important to note that the regulations contained in this publication are far less restrictive than other directives and WILL NOT BE USED DURING NON-TTECG TRAINING.

## **GENERAL SAFETY**

- A. The officer conducting the exercise and the operational chain of command of the exercise force are responsible for safety in the exercise force. The senior exercise force commander's responsibility for safety cannot be delegated or abrogated: he retains full authority to prohibit any activity or procedure that he considers to be unsafe.
- B. Movement to and from all training areas and numbered ranges will be coordinated and cleared through Range Control, callsign "Bearmat" on VHF 49.85 in accordance with CCO P3500.4\_.
- C. Prior to all live fire training a safety briefing will be given to all individuals participating by the designated exercise force RSO or the CO/OIC conducting the training. This briefing will review all the appropriate material contained in the GCE RSO briefing conducted on the first training day of the CAX.

## **2. MEDICAL EVACUATION (MEDEVAC) PROCEDURES**

- A. A strict safety requirement is continuous communication with the Range Control Facility (BEARMAT) at VHF 49.85.
- B. BEARMAT will coordinate all Combat Center MEDEVAC. The responsibility for determining the necessity for medical evacuation from the field to the Branch Hospital shall be made by the commander/OIC on the scene based upon advice of medical personnel present. The TTECG will assist with communications assets as necessary. The method of evacuation (ground or air) shall also be determined by the commander/OIC on the scene. BEARMAT will be notified as soon as possible, so as to inform the Branch Hospital of the incoming casualty. Casualties requiring MEDEVAC will be brought to the Combat Center Branch Hospital (LZ-16).

## **3. SEARCH AND RESCUE**

- A. In the event of a missing person aboard the Combat Center, the Director of Operations and Training will designate a Search and Rescue (SAR) Control Officer responsible for the overall planning and supervision of SAR operations.
- B. To request the SAR team, contact BEARMAT.
- C. Desert Survival Indoctrination. All personnel scheduled to train at the Combat Center will receive a desert survival lecture by Combat Center Range Management personnel prior to

commencement of training. Scheduling the briefing is the responsibility of the OCE.

#### **4. UNEXPLODED ORDNANCE**

D. Unexploded ordnance (UXO) is defined as any ordnance, or remnant thereof, which has been fired. This includes dud rounds and missiles, misfired ordnance, and pieces of expended ordnance material other than dunnage.

E. Demolition of Unexploded Ordnance. The presence of red smoke in a training area indicates an EMERGENCY STOP EXERCISE condition exists or that the Combat Center's Explosive Ordnance Disposal (EOD) unit is destroying UXOs. If red smoke is sighted within 1,000 meters of your position, immediately cease all movement and notify higher headquarters and BEARMAT of the situation and your location. BEARMAT will contact the Combat Center's EOD Unit, who will provide safe escort out of the area.

F. UXO Handling. UXOs will not be destroyed, moved, or tampered with in any manner by other than EOD personnel. UXOs can be found throughout the Combat Center's range/training areas and are extremely dangerous.

G. UXO Indoctrination. All personnel scheduled to train at the Combat Center will receive a UXO orientation lecture by home base EOD personnel or the Combat Center EOD personnel prior to commencement of training. Scheduling the briefing is the responsibility of the OCE.

H. EOD Unit. The Combat Center EOD Unit can be contacted by telephone, AV 952-6885/7215 (DWH) or through BEARMAT.

**5. EAR/EYE PROTECTION.** The current edition of BUMEDINST 6260.6 requires that all personnel exposed to gunfire in training situations will wear ear protection devices regardless of the length of exposure. Due to LASER hazards inherent with the CAX program the use of non-military issue binoculars is prohibited.

**6. HELMET AND BODY ARMOR.** Helmets and Body armor will be worn during all live fire training. The prescribing and enforcing of personnel protection measures is the responsibility of the OCE.

#### **7. TTECG RANGE REGULATIONS**

##### **A. Small Arms**

## 1) General

- a. Shoot only at designated targets. If a target is not visible to a Marine, he will not fire. The target arrays presented to the Marines consist of the following:
  - (1) personnel silhouettes painted white or black/dark green,
  - (2) vehicle silhouettes painted black/dark green,
  - (3) sand-bag bunkers along trench lines,
- b. No other targets or vehicle hulks are authorized as 5.56mm or 7.62mm targets. The targets are not painted any color other than as specified above.
- c. No firing from moving vehicles except during the Convoy Security Operations Course and only when a controller is present aboard the vehicle.
- d. Clear, positive, redundant signals to cease/shift BOF are required.
- e. Assign clearly defined sectors of fire (use ADDRAC to control direct fires).
- f. M60 / M240, M2 HB, and Mk19 machine guns' T&Es must be locked on tripod or vehicle mount. EXCEPTION: M-60 / M-240G machine-guns may be fired from the bipod, during dismounted assaults, while conducting fire and maneuver. Additionally, the M2 .50 cal. or Mk-19 may be employed from the 5-Ton ring mount only during the Convoy Security Operations Course. Machine guns will be cleared to fire from ring mounts during the convoy security operations course only when a controller is aboard the vehicle.
- g. Marines will fire their weapons only from stationary positions. Marines will not fire their weapons while moving. Marines may fire from the prone, sitting, kneeling, standing, or other modified stationary position.
- h. Treat every weapon as if it were loaded.
- i. Never point a weapon at anything you do not intend to shoot.

j. Keep your finger straight and off the trigger until you are ready to fire.

k. Keep the weapon on safe until ready to fire.

## 2) Overhead fire

a. See safety diagram (Appendix A-1).

b. A minimum of 10 meters clearance above personnel, vegetation, and intervening terrain is required for 7.62mm and .50 caliber weapons systems.

c. MK-19, M16A2s, M-249 (SAWS), and M-203s are not authorized for overhead fire.

d. M-60/M-240G overhead fire is authorized only when Marines are more than 300 meters and less than 750 meters from the firing position, or if vertical interval of Marines below the gun/target line is, in the opinion of the commander, such as to make safety obvious. (e.g. from machine-gun hill at Range 400). T&Es will be locked down and tripod legs sandbagged. Rate of fire will never exceed the sustained rate of fire.

e. .50 caliber machine gun may be fired overhead only if Marines are more than 350 meters and less than 850 meters from firing position, or if vertical interval of Marines below the gun/target line is, in the opinion of the commander, such as to make safety obvious. (e.g. from machine-gun hill at Range 400). T&Es will be locked down and tripod legs sandbagged. Rate of fire will never exceed the sustained rate of fire.

f. Positive depression stops will be constructed to prevent any firing below the minimum safe vertical interval. All depression stops will be inspected by TTECG and registered/ tested by fire prior to delivering fire over troops.

g. When firing from the ground mount the front leg of the 50 cal. tripod will be dug-in to prevent slipping.

h. No overhead fire from vehicle mounts.

## 3) Fire and Maneuver

a. See safety diagrams (Appendix A-2).

- b. Base of fire (BOF) must have 50 meters lateral clearance for 7.62 mm and 5.56 mm trajectories to flank and front of maneuvering personnel.
- c. BOFs for 50 cal. & Mk-19 machine-guns must have 100 meters of lateral clearance to the flank and front of maneuvering personnel. When ground mounted, the front leg of the heavy machine gun tripod will be dug-in to prevent slipping.
- d. No fire may be directed at "hard targets" (e.g. tank or retriever hulks) while conducting fire and maneuver in the vicinity of the "hard targets."

#### 4) Fire and Movement

- a. See attached safety diagram (Appendix A-2).
- b. When firing 5.56 mm during individual fire and movement Marines must maintain 5 meters of lateral clearance and keep the impacts of rounds at least 50 meters from maneuvering personnel.
- c. Weapons must be on safe when moving.
- d. Particular care must be taken to ensure that fire is not directed toward ricochet producing targets while conducting fire and movement (e.g. tank hulks).

#### 5) Defensive Fire Planning

- a. The minimum safe separation angles stipulated in appendix C apply for all weapon systems during the defense. Prior to the start of any engagement, a TTECG representative will review the disposition of ground forces and inspect the unit fire plan sketch and range cards. If any disparities are noted, the unit will remain cold until the inconsistency is resolved.
- b. The company commander must take special care to ensure that fire plan sketches and crew served weapons range cards are complete and accurate (See Appendix A-3 for an example). Well defined lateral limits, azimuths of fire, and a clear signal plan must be established and understood by all Marines. The company commander/engagement area commander is responsible for ensuring that all units have effected detailed coordination, and that the lateral limits/sectors of fire assigned to each element guarantee that minimum

safe separation between all fires and friendly positions are not violated.

#### B. M-67 Fragmentation Grenades

- 1) Fragmentation grenades will be used on Range 410A during TTECG sponsored training only. Additionally, grenades will only be employed under the positive control of a Coyote.
- 2) Personnel designated to throw live fragmentation grenades must rehearse the employment of grenades with practice grenades prior to running the range. Additionally, they must rehearse in the specific trench and at the specific point in the trench they will employ the grenade. Only Marines who have completed rehearsals to include "dropped grenade" procedures observed by TTECG will be authorized to employ grenades on 410A.
- 3) Frag grenades will only be carried in the 782 gear pouches designed for that purpose. Grenades will be firmly seated in the pouch with the safety pin and safety clip attached and the pouch retaining strap fastened. No additional items will be attached to the grenade. (ie tape, etc.)
- 4) No gloves will be worn while handling grenades.
- 5) Grenades will not be "milked".
- 6) Grenades will not be passed between Marines after crossing the LOD.
- 7) The ECR for a fragmentation grenade is 15 meters and the fuze burn time is 4-5 seconds.
- 8) **Grenade employment procedures:** Prior to a Marine employing a fragmentation grenade when directed by the unit leader, the Marine will make eye contact with the squad Coyote and clearly state **"Request to Prep Frag"**. The Coyote will clear or deny the preparation of the fragmentation grenade. Preparation of the grenade consists of the Marine: **1.** Removing the grenade from the carrying pouch **2.** Removing the safety clip and **3.** Removing the safety pin. Once the grenade preparation is complete the Marine will maintain eye contact with the target area and clearly state **"Frag out"**. The Coyote will again clear or deny the employment of the grenade. After



throwing the grenade, the Marine will immediately proceed to the covered position and wait for the detonation.

- 9) Only the grenade man will be forward of the sandbag berm while employing the grenade.
- 10) **Dropped grenade procedures:** Should the Marine throwing the grenade drop the grenade, he will immediately shout "**Grenade**" and assume a position behind the sandbag barrier head toward the berm. All other Marines in the trench will go prone helmet toward the grenade. If a long throw occurs personnel outside the trench will shout "**Grenade**" and assume the prone position, helmet towards the grenade.
- 11) A pause of the exercise will be initiated in the event of a dud grenade being thrown. All unnecessary movement on the range will halt until the Unit Commander, TTECG and EOD have assessed the situation.
- 12) Exercise force EOD personnel are required to be present on the range prior to the employment of grenades in order to clear DUDs.
- 13) Only 1 clearing team of 4 Marines will be authorized per axis of the trench until the trench junction is secured.

#### C. M-203

- 1) Illumination, pyrotechnic and TP rounds may be used in all live fire and maneuver training areas. Consult the Range regulations to ensure that the 40mm DODIC you intend to use is authorized for the training area in which you are located. If any doubt exists, call Bearmat and confirm that you are using an authorized DODIC. TP B577, 40 mm ammo is not authorized on the Range 400 series or in any maneuver training area.
- 2) HE, HEDP and buckshot may not be used during any TTECG sponsored event.
- 3) Company commanders must ensure there are no HE, HEDP or Buckshot rounds issued.
- 4) TP round trajectories must have 5 meters clearance to flank and impact at least 65 meters from maneuvering personnel.
- 5) 40 mm rounds are not authorized for overhead fire.

#### **D. Mk-19 Grenade Launcher**

- 1) Maneuvering forces must maintain 100 meters of lateral clearance from the gun target line.
- 2) Only TP-T (DODIC B576) rounds are authorized on CAX events. Company Commanders must ensure that no other DODICs have been issued. Special attention must be paid to the DODIC, as two types of TP-T are available. **TP-T DODIC B584 may not be fired in the live fire maneuver areas as it will create a dud hazard.**
- 3) Minimum engagement distance for the Mk-19 will be 100 meters.
- 4) Mk-19 Grenade Launchers are not authorized to fire over head.

#### **E. AT-4**

- 1) Ensure all personnel are outside the 45 degree safety arc on each side of the gun target line.
- 2) Ensure all personnel are clear of the back blast area, 90 degrees, and 100 meters to the rear when fired.
- 3) Minimum safe engagement distance, 50 meters.
- 4) Cannot be fired overhead.
- 5) Transport safety pin should be inserted until ready to fire.
- 6) Ensure cocking lever is in the safe position until ready to fire.

#### **F. SMAW**

- 1) Ensure all personnel are outside the 45 degree safety arc on each side of the gun target line.
- 2) Ensure all personnel are outside the back blast area 60 degrees to the rear for 90 meters.
- 3) Minimum engagement distance, 150 meters.
- 4) No overhead fire.

- 5) Practice and HE rounds may be used in all live fire and maneuver areas. Additionally, HE rounds may **not** be used on R-410A.
- 6) If HEAA fails to detonate, all personnel and vehicles must remain 150m from the dud round for 30 minutes.

#### G. Dragon

- 1) Ensure all personnel are outside the 45 degree safety arc on each side of the gun target line.
- 2) Ensure all personnel are outside the back blast area 90 degrees to the rear for 50 meters.
- 3) Minimum engagement distance, 250 meters.
- 4) No overhead fires.
- 5) If the dragon round fails to detonate on impact after traveling 65m, all personnel and vehicles must remain at least 250m from the round for 30 minutes.

#### H. TOW

- 1) Ensure all personnel are outside the 47 degree safety arc on each side of the gun target line.
- 2) Ensure all personnel are outside the back blast area 90 degrees to the rear for 75 meters.
- 3) Minimum engagement distance, 700 meters.
- 4) No overhead fires.
- 5) **HE missiles may not be fired at THM-TG targets during CAX.**
- 6) Dud TOWs. If the sustainer motor engages (the TOW is propelled more than 700m down range) but the missile fails to detonate, all personnel and vehicles must remain 700m from the round for one hour.
- 7) The keveler blanket will be used for **all** TOW live firing.

#### I. Javelin

- 1) Before firing any Javelin Missiles, the entire SDZ must be cleared of non-mission essential personnel.

- 2) Ensure all personnel are outside the backblast area 60 degrees to the rear for 100 meters.
- 3) Minimum engagement distance, 500 meters Top Attack and Direct Attack Mode.
- 4) No overhead fires.
- 5) HE Missiles may not be fired at THM-TG Targets during CAX.
- 6) If the Javelin round fails to detonate on impact within 1000 meters of the Gunners position, all personnel and vehicles must remain at least 500 meters from the round for 30 minutes.

J. **Sniper Rifles** are authorized for overhead fire on TTECG sponsored events. The following conditions must be met for overhead fire to be approved by the TTECG.

- 1) Sniper teams must be accompanied by a TTECG controller (Scout Sniper or Recon Sidewinder) who has contact with the maneuver representative running the evolution.
- 2) Sniper teams must include a designated spotter who will constantly keep the sniper informed of the lead trace of friendly forces and track each round to target.
- 3) Snipers will ensure that the weapon has a good zero (Refer to ITS standard 8541.1.5).
- 4) Sniper rifles will be fired from a bench rest constructed from sand bags or other suitable material.
- 5) A minimum of 10 meters vertical separation over the head of friendly troops must be maintained.
- 6) Lateral separation from the lead trace of friendly troops and the impact of the round will be 50 meters for the 7.62 mm sniper rifle and 100 meters for the .50 caliber sniper rifle.

K. **Tanks**

- 1) Tank main gun
  - a. Maintain a 22 degree safety arc on either side of the gun-target line when firing training ammunition and a 47 degree safety arc when firing live HEAT ammunition.

A maximum of 10 degrees quadrant elevation may be maintained when firing the main gun.

- b. No round may impact within 1,000 meters of any personnel or vehicles, except other tanks.
- c. When conducting simultaneous engagements with tank main gun and fixed wing CAS on the same target, an aircraft "stay above" target of 2,000 feet AGL will be used. The maximum engagement range for tank main gun during a simultaneous engagement will be 4,000 meters. No steel targets such as tank hulks or metal debris will be attacked with direct fire during a simultaneous engagement.
- d. Simultaneous engagements with tanks firing main gun at a near target while CAS is engaging a far target along the tank gun-target line can be conducted only if the far target is further than 7,250 meters (distance X) from the tank's firing position. The tank target (near) can be no further than 4,000 meters and fired with a clear ballistic solution.
- e. Unprotected (dismounted) troops and 'unarmored' vehicles must maintain 70 meters of lateral separation from the flanks of tanks firing the main gun.

## 2) .50 Caliber

- a. May not engage any target at ranges less than 100 meters.
- b. Must have 100 meters lateral clearance from maneuver elements.
- c. 1,600 meter maximum range will be used when supporting dismounted troops.
- d. May not be fired while the tank is on the move.
- e. If CAS and tanks are simultaneously engaging a target on which the tanks are employing their .50 Cal. machine gun, an aircraft "stay above" of 4,000 feet AGL will be used for the aircraft.

## 3) 7.62 COAX

- a. May not engage any target at a range less than 50 meters.

- b. Must have 50 meters lateral clearance from flanks of maneuver elements.
  - c. 900 meter maximum range will be used when firing in support of dismounted troops.
  - d. May be fired while the tank is on the move.
- 4) 7.62 Loader's Machine-gun: Use of the loader's weapon is discouraged. If the loader's M-240 is employed, all impacts must be 500 meters from maneuvering armored vehicles, and will cease as soon as any personnel dismount forward of the firing tank.
- 5) No overhead fire is permitted with any tank weapon system.

#### **L. AAV Upgun System**

- 1) May not engage any target less than 100 meters.
- 2) Must have 100 meters clearance from flanks and front of maneuver elements.
- 3) May not fire while the AAV on the move.
- 4) May not fire overhead.
- 5) Only TP-T (DODIC B576) allowed for Mk-19.
- 6) 1,600 meter maximum range will be used when supporting dismounted assaults with the M-2.

#### **M. LAVs**

- 1) 25 mm Chain gun
  - a. No overhead fires are permitted.
  - b. 25 mm TPT (DODIC A 976) is the only 25 mm round authorized for TTECG events.
  - c. Initial rounds require a 24 degree safety arc on either side of the gun-target line. The parameters outlined below apply for subsequent rounds.
    - (1) No round may impact within 500 meters of any maneuvering personnel or vehicles for a stationary firing LAV.

(2) No round may impact within 1000 meters of any maneuvering personnel or vehicles for a moving firing LAV.

- d. Vehicle commanders will ensure that no personnel or vehicles are in front of them prior to cycling ghost rounds. Vehicle commanders will obtain clearance from TTECG prior to cycling ghost rounds.
  - e. LAVs without thermal sight capability will conduct night live fire under illumination. LAVs with thermal sight capability are authorized to fire with out illumination if targets have been 'thermalized' and prior coordination has been made with TTECG.
  - f. If a LAV is simultaneously engaging a target with 25 mm while fixed wing CAS is employed on the same target, a 3,000 foot AGL feet stay above will be used for the CAS aircraft.
  - g. Simultaneous engagements with LAVs firing the 25mm at a near target while CAS engages a far target along the LAV gun-target line can be conducted only if the far target is further than 6,047 meters (distance X) from the LAVs firing position.
- 2) Vehicle Commander's Machine-gun: Use of the VC's weapon is discouraged. If the M-240 is employed, all impacts must be 500 meters from maneuvering armored vehicles, and will cease as soon as any personnel dismount forward of the firing LAV.

3) 7.62 COAX

- a. May not engage any target less than 50 meters.
- b. Must have 50 meters clearance from flanks of maneuver elements.
- c. 900 meter maximum range will be used when firing in support of dismounted troops.
- d. May be fired while the LAV is on the move.

**N. Employment of Smoke Grenade Launcher / Self Screening Smoke**

- 1) Tanks/AAVs/LAVs must button up prior to firing smoke grenades.

- 2) Unprotected personnel are not permitted within 75 meters of a tank/AAV/ LAV firing the M-239 smoke grenade.
- 3) Positive clearance from the FSC and TTECG must be obtained prior to firing self screening smoke or engaging vehicle smoke generators.

#### O. Mortars

- 1) No overhead fire at any time. The mortar gun-target line must be at least 400 meters from the closest friendly unit. If the gun-target line is less than 400 meters from the nearest unit, that unit is in the area "A" of the mortar gun-target line and the mortar position will not be cleared to accept fire missions. If the mortar position is generally on line with the lead trace (as in a defensive problem) the 400 meter lateral separation is not required if the mortar direction of fire is generally perpendicular to the line of troops. Refer to MCO P 3570.1A and appendix C-12 for amplification on this matter.
- 2) All 81mm mortar missions will be cleared by grid by the TTECG Artillery Representative except on R-400. When directed by the TTECG artillery representative the FiST Coyote will clear missions.
- 3) All 60mm mortar missions will be cleared by a TTECG maneuver representative on the gun line or with the company FiST. 60mm mortars **may not be fired** unless cleared by the TTECG representative located with the requesting rifle company.
- 4) The initial mission for mortars used in the indirect, direct alignment or handheld modes must be at least 1,000 meters from all personnel.
  - a. After two volleys from all tubes have been observed on target, the senior TTECG maneuver representative may clear maneuver forces to close within 400 meters of mortar impacts. This clearance will be communicated to the exercise force leaders by controllers located with their units.
  - b. At Range 400 only, the senior TTECG maneuver representative may clear maneuver forces to close within 250 meters of mortar impacts.



- 5) Mortars in the direct lay mode may be used during daylight assaults only if the following conditions are met:
  - a. 1 - The mortars have a clear line of sight to the target
  - b. 2 - The mortars have a clear line of sight to the maneuver element
  - c. 3 - The Maneuver Element has a positive communications link with the mortars
- 6) If these conditions are met the initial missions for both 60mm and 81mm mortars used in the direct lay mode must be 400m from all personnel. After the initial rounds have been observed impacting on the target area, the TTECG maneuver representative with the FIST may clear maneuver forces to close within 250 meters of mortar impacts for 60mm mortars. Additionally, personnel must stay at least 250 meters off of the gun-target-line for 60mm mortars and 400 meters off the gun-target-line for 81mm mortars.
- 7) When mortars are fired in support of maneuver and a misfire occurs, no immediate action will be initiated until the maneuver is completed and troops are out of the impact area. The use of trigger fire immediate action for the 60mm mortar is authorized if the mortar is firing a charge 2 or less, the spherical projection remains in the base plate, and the bipod remains stationary. NO KICKING OF THE TUBE WILL BE ALLOWED WHEN TROOPS ARE DOWN RANGE. Misfires on Range 400 will be cleared under the supervision of the Exercise Force after completion of the attack and TTECG has departed the range.
- 8) For 300 series ammunition, variable time (VT) fuses will **NEVER** be used during a TTECG event. For 800 series ammunition, multiselectable fuses will be set in the point detonating mode only.
- 9) Use of 81mm mortars in Helo Assaults
  - a. The requirement that 81mm mortar missions must be cleared by the battalion FSC can be waived provided a RFL or AOR is established between the helicopterborne unit and the main exercise force.
  - b. With the above condition adhered to, the senior TTECG maneuver representative present may clear 81mm mortar missions at the request of the company commander (or

the TTECG artillery representative) in his zone of action during the helicopterborne operation.

- c. Fire missions that originate inside the AOR/zone of action and impact outside of the AOR/zone of action must be cleared by an exercise force FSC in accordance with TTECG clearance procedures.

**P. Artillery.**

- 1) The TTECG artillery representative will **clear all artillery targets by grid**, through the exercise controller located with the fire direction center of each firing battery. This clearance procedure will be in addition to the positive clearance required of the exercise unit's fire support coordination center.
- 2) Per CG, MCAGCC waiver of 26 June, 1997, **artillery units have the option to waive the use of Minimum Safe Lines (MSLs) during TTECG sponsored events.** Based upon the waiver, artillery units have two options for mission clearance procedures while at CAX:
  - a. **If MSLs are not used**, all indirect fire targets will be cleared by grid from the TTECG artillery representative. The TTECG artillery representative will either "CLEAR" or "DENY" the target grid, subsequent corrections, or any changes to the mission through the indirect fire controller located in each fire direction center. Each target will require positive clearance from the exercise force fire support coordination center.
  - b. **If MSLs are used**, the following procedure will take place: MSLs may be placed into effect or canceled **only by the TTECG Artillery Representative.** The TTECG artillery representative will either "CLEAR" or "DENY" the target grid, subsequent corrections, or any changes to the mission through the indirect fire controller located in each fire direction center. If a target grid or subsequent correction plots less than 1,000 meters beyond the current MSL in effect, the FDO will notify the controller, who in turn will notify the TTECG artillery representative. The TTECG artillery representative will plot the target grid, contact the senior TTECG maneuver representative, state the target grid, and ask if the target grid is clear. The senior TTECG maneuver representative will confirm the location of exercise force and controller personnel. If the

target grid is laterally separated from personnel by a minimum of 1,000 meters (500 meters for equipment) the senior TTECG maneuver representative may "CLEAR" the mission. If the minimum lateral separation does not exist between the target grid and personnel/equipment, the senior TTECG maneuver representative will "DENY" the mission. The TTECG artillery representative will then contact the controller with the firing agency and relay "CLEARANCE" or "DENIAL" of the target grid.

c. In both clearance methods above, all artillery units will abide by JtRegtO P3570.1A, Appendix-L.

- 3) **If MSLs are used**, each FDC will compute a minimum quadrant elevation to achieve a range 1,000 meters beyond each MSL in the center of the corridor in which live fire is being conducted. This data will provide the FDC a check in the event that a target grid or subsequent correction results in data 1,000 meters or less from the active MSL. Upon notification of this, the artillery representative will conduct the checks described in (2) above and if a 1,000 meter separation from troops is maintained, the target grid may be cleared. The FDC will be required to positively clear the firing data as being below the minimum quadrant in effect when sent to the gun line. EXCEPTION: **Minimum quadrant derived from intervening terrain will not be violated.**
- 4) **SDZ diagrams and Safety Ts.** Due to the above safety procedures, SDZ diagrams and Safety T's are not necessary for units participating in the CAX during exercises under TTECG control.
- 5) **Variable Time fuses.** Variable Time (VT) fuses will **NEVER** be used during a TTECG event. VT fuses will not be stored on the gun line during a TTECG event. Time fuses for other than Base Ejecting Munitions are not authorized. Time fuses other than M577 will not be stored on the gun line.
- 6) **Burning power.** Powder will not be burned when aircraft are inbound. Clearance to burn powder will be requested from TTECG and the unit FSCC.
- 7) **Final Protective Fires.** Final Protective Fires (FPF) may be adjusted/recorded when troops are forward of the FPF position. There must be a 1000 meter separation between the FPF grid and the position of any personnel (i.e. the FLOT/battle position, Security positions forward, forward

battle positions, etc.). Road guards will be placed to ensure no personnel move into the firing area while the FPF is being adjusted/recorded. This procedure will be coordinated between the exercise force Fire Support Team (FiST) controlling the fires and the TTECG representative with the FiST. The TTECG representative with the FiST will coordinate these fires with other TTECG personnel. The exercise force is responsible for coordinating and clearing these fires with the appropriate FSCC.

- 8) **Check rounds.** Check rounds will be conducted and cleared by the TTECG artillery representative. The exercise force FSCC does not need to be involved in clearing check rounds. This is a safety/administrative requirement and has no tactical significance. During Defensive exercises, check rounds may not always be accomplished prior to the beginning of the exercise because of battery positions and range capabilities. In these situations the first round of the battery's first tactical mission will be used as the check round. If the first mission is a FFE, credit will be given for a FFE as long as the rounds are on time and accurate.
- 9) **Artillery illumination.** Artillery illumination fired in support of night attacks is not bound by the 1,000 meter lateral separation used for high explosives. The grid for illumination may be within 1,000 meters of the lead trace. At no time will the illumination grid be to the rear of the lead trace.
- 10) **Firing unit locations.** Recommended firing unit locations for each CAX event are listed in appendix-D.

#### **Q. Rocket Assisted Projectile (RAP)**

- 1) RAP can be used during Combined Arms Exercises.
- 2) RAP cannot be fired overhead of personnel or equipment.
- 3) Overhead fire of RAP is currently under review. See TTECG Artillery Representatives for further questions.

#### **R. Aviation**

- 1) Minimum safe separation from maneuver elements:
  - a. Any loft-delivered ordnance - 2,000 meters
  - b. Fuel Air Explosives - 2,000 meters

- c. TOW/HELLFIRE - 1,000 meters
- d. Napalm, Rockets and Guns - 1,000 meters
- e. Mk-82, 500 pound bombs - 1,300 meters
- f. Mk-83, 1,000 pound bombs - 1,700 meters
- g. Mk-84, 2,000 pound bombs - 2,100 meters
- h. Mk-80, series inert ordnance - 1,000 meters (note 1)
- i. Inert/Live Ordnance mixed aircraft load - minimum safe for the live ordnance applies to the inert ordnance. (note 1)

**Note:** The Mk-80 series inert ordnance minimum safe distance applies only when all free fall ordnance carried by the aircraft is inert. Aircraft with mixed loads of free fall ordnance (high explosive and inert) will utilize the minimum safe distance for the type of high explosive ordnance carried.

- 2) NIGHT: For all night aviation ordnance deliveries in close proximity to troops there must be a clearly discernible mark. For this purpose the mark may be from indirect WP, RP, illumination on the deck, a LASER, or an IR pointer (with proper terminology employed).

**3) Simultaneous engagements with tank main gun (120mm) or LAV 25mm.**

- a. When FWCAS is engaging the same target as the tank or LAV, the following "stay above" altitude restrictions are required. Fixed wing can not engage a target deep of the tank or LAV target unless the CAS target is outside of distance X (SDZ Length) of the tank or LAV SDZ.

	Aircraft Stay Above (Feet AGL)	SDZ Length Distance X (Meters)
120mm	2,000	7,250
25mm	3,000	6,047

- b. The aircraft attack azimuth must be perpendicular to the tank or LAV gun target line. In addition, the egress routing of the CAS aircraft shall be planned so

that the direct fire weapons beaten zone and the flight path of the aircraft are deconflicted. Tanks and LAVs will not engage vehicle hulks during simultaneous engagements

**4) Simultaneous engagements with 50 cal. / 7.62mm / 5.56mm.**

- a. FWCAS can engage the same target as the direct fire weapon or a target deep of the direct fire target when the following aircraft "stay aboves" are given. If the CAS target is further than distance X from the direct fire weapon's firing position no "stay above" is required for the direct fire weapons.

	Aircraft Stay Above (Vert Haz x 3.3 +1000) (Feet AGL)	SDZ Length Distance X (Meters)
50 cal.	4,000	6,500
7.62mm / 5.56mm	3,000	5,288

- b. When Rotary wing CAS is employed simultaneously with direct fire weapons on the same target, an attack position which provides lateral separation from the effects of the direct fire weapon's SDZ will be used.

**5) TOW.** The airborne TOW missile will not be fired over the heads of troops. The WTL should be perpendicular to the FLOT when possible and never at less than a 30 degree angle away from the FLOT. Refer to appendix C-8 for TOW SDZ.

**6) HELLFIRE.** HELLFIRE missile engagements will be conducted using one of the following methods: 1) Lock-On After Launch - Direct (LOAL-D) for autonomous designations; 2) Lock-On Before Launch (LOBL) or LAOL-D for remote designations. Regardless of which method is used, the aircrew and FAC/FAC(A) will confirm the grid for the firing position, the grid for the designated target, and will ensure Hellfire Direct Launch Surface Danger Zone (SDZ) and backblast area are clear of all personnel and equipment. If LOBL is used with remote designation; the target will be designated, the aircrew will then confirm a good spot and that the missile seeker is pointed at the intended target by announcing "spot" on the TAD net. The LASER designator may then be secured and the missile launched with a delayed designation. Refer to appendix C-11 for HELLFIRE SDZ diagrams. The backblast area (Area F) is defined as 50 meters to the rear and 15 meters to either side of the launch aircraft. The angle between

the LTL and WTL shall never be greater than 60 degrees for either ground or airborne designators. The vertical hazard from the HELLFIRE missile extends upward along a 40 degree angle to 22,000 feet out to a range of 11,300 meters. If rain conditions are present during launch, all attempts should be made to keep the LASER designator dry and clear.

**7) LGBs.** The delivery fixed wing aircraft shall be equipped with a functional Laser Spot Tracker (LST) for the delivery of Laser Guided Bombs (LGB) when under the control of a FAC utilizing a ground laser designator (MULE) or a rotary wing laser designator. A secondary mark, in addition to laser designation, will aid the pilot in visually acquiring the target and verifying the laser spot corresponds to the intended target. However, a preparatory practice run will not be required for fixed wing delivery of LGBs in the absence of a secondary mark when the pilot can verify that the laser spot corresponds with the intended target. A preparatory practice run will be made or a visual mark provided in those instances where the pilot cannot verify that the laser spot corresponds to the target area. All of the following conditions must be met before clearance is given by the FAC and the aircraft releases the LGB:

- a. Aircraft delivering LGBs must be outside the plus or minus 10 degree safety cone (20 degrees total) from the target to designator line.
- b. Aircraft must be forward of the FLOT.
- c. Aircraft must be pointed at the intended target.
- d. Aircraft must be wings level.
- e. Aircraft is receiving a valid laser spot as determined by the LST.
- f. The pilot has visually verified the laser spot corresponds with the intended target.
- g. A "cleared hot" has been received from the FAC.

**8) NAPALM.** Unignited NAPALM poses a safety threat to personnel due to the potential for ignition of the fuel and/or vapors. Unignited fuel may be spread in an elliptical pattern 50 feet wide and 300 feet long. Personnel shall avoid the unignited fuel caused by NAPALM by at least 100 meters.

- 9) **LUU-2.** When fixed or rotary wing aircraft drop LUU-2 flares, the FLOT, manned NFAs, winds and run-in headings all must be considered due to chute collapse with suspension line cut at flare burnout and the possibility of improper delivery altitude/ignition setting or parachute malfunction. Under no circumstances will the flare delivery pattern be located over or behind friendlies and shall be parallel or away from the FLOT. Winds and drift shall be calculated to result in flare burnout/chute collapse no closer than 2,000 meters to the FLOT. When flares are delivered under control of a ground FAC, a "Cleared Hot" is required.
- 10) **SIDEARM.** For SIDEARM fired from AH-1Ws, the WTL shall be oriented so that troops are outside of the surface danger zone that forms a fan that is +/- 60 degrees on either side of the WTL (120 degree fan) extending out to 6.1 nautical miles. Launch aircraft crew shall report having a good missile tone (indicating lock-on) prior to being cleared to fire the missile.
- 11) **Forward Firing Rockets.** For engagements with rockets from AH-1W/UH-1N the target must be at least 1 km beyond the FLOT. No aircraft will be cleared to fire while located behind friendly positions. If an AH-1W/UH-1N is simultaneously engaging a target with 2.75" or 5.00" rockets while FWCAS is employed on the same target, a minimum 3000 feet AGL stay above will be used for the FWCAS aircraft. The WTL shall be oriented so that troops are outside of a fan that is +/- 5 degrees on either side of the WTL and extending out to the following ranges:
- |               |             |
|---------------|-------------|
| 2.75" Rockets | 7000 meters |
| 5.00" Rockets | 9400 meters |
- 12) **Helicopter Gunnery (20mm, 50 Cal., 7.62mm)**
- a. General. The target must be at least 1 km away from all personnel. The aircraft must be forward of the FLOT and must pull off its target run away from the FLOT.
  - b. Extreme caution will be exercised to insure that the WTL is at least 45 degrees away from all personnel.
  - c. CH-46/53 door guns. Aircrews must be briefed on 50 cal. SDZ (+/- 45 degrees off WTL out to a range of 6.5 km). Aircrews will not fly profiles that place aircraft inside the SDZ of weapons fired from other aircraft in the same flight.



- d. AH-1W 20mm. If an AH-1W is simultaneously engaging a target with 20mm while FWCAS is employed on the same target, a minimum 3000 feet AGL stay above will be used for the FWCAS aircraft. Simultaneous engagements with AH-1W 20mm at a near target while CAS engages a far target along the AH-1W gun-target line can be conducted only if the far target is further than 4500m (distance X) from the AH-1W's firing position.
- 13) Final Attack Cone / RFA,NFA Relationship.** A "CLEARED HOT" will not be given when aircraft are pointed at the FLOT during the terminal phase of the attack. Aircraft carrying free-fall ordinance (HE and/or inert) may be "CLEARED HOT" when pointed at manned NFAs/RFAs as long as the distance from the location of the friendlies within the NFA/RFA to the target is greater than the **minimum safe distance for the ordinance plus 2000 meters.** Aircraft carrying forward firing ordinance shall not be "CLEARED HOT" if pointed at NFAs/RFAs.
- 14) FAC(A) Self-Control Procedures.**
- a. All FAC(A) self-controlled engagements shall be cleared beforehand by the appropriate Fire Support Coordination Center (FSCC).
  - b. FAC(A)s shall establish communications with a TTECG representative on assigned Tactical Air Direction (TAD) net and broadcast engagement intentions including TOT. The TTECG representative will acknowledge your transmission.
  - c. FAC(A)s shall broadcast "CLEARED HOT" prior to weapons release.
- 15) Waiver of requirement for FAC/FAC(A) control.** The requirement for a FAC/FAC(A) to terminally control CAS aircraft is waived during FSCEX II, FSCEX III, and FINEX when all of the following conditions are met:
- a. TTECG approval is received prior to the exercise.
  - b. CAS aircraft receive a targeting assignment by the senior FSCC, the DASC, or the TACC. The targeting assignment can be a specific target including a six digit grid or it can be the assignment of an area in which to search for targets such as a named area of interest (NAI).

- c. If NAIs are used they must be identified and approved by TTECG prior to the exercise. Each NAI shall be defined and delineated on the ATO and the area shall be completely clear of all personnel (scoutsniper/recon teams, etc.).
- d. All targets to be attacked shall be at least ten kilometers beyond the FLOT.
- e. The CAS aircraft are given ingress and egress routing by the senior FSCC or the DASC along with any other deconfliction instructions required.
- f. CAS aircraft establish two way direct communications with a TTECG air representative on an assigned TAD frequency.
- g. CAS aircraft pass the target assignment and planned attack parameters to the TTECG air representative prior to commencing the attack.
- h. The TTECG air representative must have the target area in sight and give approval for the attack before the attack may commence.

**16) TTECG DOES NOT clear fires but WILL monitor your transmissions and act as a safety backstop for proposed engagements. If TTECG observes any potential safety concerns with your mission, the TTECG representative will advise you on the nature of the problem. AT NO TIME IS THE EXERCISE FORCE RELIEVED OF THE RESPONSIBILITY FOR SAFELY EXECUTING THE MISSIONS.**

**S. Restrictive Fire Support Coordination Measures for R&S Teams, EW Teams, and Retrans Teams**

- 1) The exercise force will establish appropriate, restrictive fire support coordination measures to protect units operating forward of the Forward Line of Own Troops (FLOT) from the effects of fires.
- 2) During TTECG-sponsored events, the effects of fires is defined as the ordnance minimum safe distances and weapons SDZs contained in the CAX Safety Handout.
- 3) R&S teams and EW teams must have an assigned controller, be equipped with a functional GPS to aid in accurate

position reporting, and maintain communications with the TTECG intelligence representative through the controller.

- 4) Communications retrans teams forward of the FLOT that will be conducting displacements within an assigned area must have an assigned controller, be equipped with a functional GPS to aid in accurate position reporting, and maintain communications with the TTECG intelligence representative through the controller. Retrans teams that will remain in a stationary position do not require a controller or GPS, but must remain in a single, stationary location known to the senior exercise force FSCC.
- 5) TTECG will establish, and disseminate to the exercise force, restrictive fire support coordination measures for TTECG communications retrans sites, TTECG aviation representatives in OPs, and other TTECG-manned positions forward of the FLOT.

## **T. Demolitions**

### **1) Minimum Safe distances:**

- a. Satchel charges - 100M (Marines must be in defilade positions), 300M in open.
- b. Bangalore torpedoes - 100M (Marines must be in defilade positions), 200M in open (parallel to axis of charge), 1000M in open (perpendicular to axis of charge).
- c. Cratering charges - 500M in open. 100M in missile-proof shelters
- d. Line charge - Marines not in a buttoned up AAV or tank must be 200 meters to the rear or 800 meters to either flank of the launch point. See appendix C-13 for amplification.
- e. Flame field expedients (fougasse) will only be used with prior TTECG approval. Personnel shall avoid the unignited fuel caused by NAPALM by at least 100 meters.
- f. Claymore mines (M18 and expedients)- 16 to 100m in defilade. Charge will only be command detonated with TTECG approval. Once primed, no personnel are allowed within 16m of the device.

- g. Charges in open: <27lbs- 300m, 27 to 500lbs-  
D=100x(cube root of charge weight), >500lbs- 800m.
- 2) Guarded / Reserve demolitions will be inspected after detonation.
  - 3) Other than as specified in paragraph (2) below, all priming systems will be electric.
  - 4) MICLIC. The MICLIC (both internal and external) will only be launched when cleared by the TTECG Combat Engineer Representative. The MICLIC will only be detonated when cleared by the TTECG Combat Engineer Representative.
    - a. Until the new fuse (MK22 Mod 5) is fielded the MICLIC will not be fired over the proofing vehicle.
    - b. Do not use a rocket that has been dropped more than 24in.
  - 5) **Non-electric firing systems**. Non-electric caps will be used only for specific shots previously cleared by the TTECG Engineer Representative.
    - a. At least a one foot length, from the coil of time fuse to be used, must be tested to determine the burn rate.
    - b. The length of fuse in the firing system will be calculated to allow all Marines to WALK to a safe location.
    - c. The minimum burn time will be one minute.
    - d. All demolitions will be dual primed.
    - e. Personnel will wait 30 minutes prior to clearing non-electric misfires.
    - f. Complete firing systems (cap, fuse, and igniter) may be assembled prior to the event however, the caps may not be attached to the charge until cleared by TTECG.
    - g. The fuse will not be ignited until cleared by TTECG.
  - 6) No smoking within 50m of demolitions.
  - 7) No radio transmissions within 5ft of electric charges or firing systems.

- 8) Demolitions in the defense and not simply part of the obstacle plan, must be incorporated into the defensive fire plan sketch of the commander responsible for the engagement area. As such, positive TTECG control is required for the initiation of the demolition.

Improvised Demolitions will only be used with prior TTECG approval and must follow, at a minimum the safety guidance contained

## **DEMOLITIONS**

### **MISFIRES**

#### **a. Clearing Electric Misfires.**

(1) Check the firing wire connection to the blasting machine or power source terminals to be sure that the contacts are good.

(2) Inspect blasting machine or power source, replace if necessary.

(3) Make two more attempts to fire the circuits.

(4a) For a single initiation system: Disconnect the firing wire from the blasting machine and shunt the ends to avoid any possible static electric detonation. Move forward to investigate the source of the misfire. The blasting machine or power source is taken forward when the charge site is checked.

(4b) For a multiple initiation system: Wait 30 minutes prior to investigating. When investigating, follow the steps indicated in (4a) above.

(5) Check the entire circuit for breaks or shorts in the wire. Tape or splice if required.

(6) If no problems are discovered with the firing wire assume that the blasting cap is the problem. Do not attempt to remove or handle an electric blasting cap that has misfired. Place a primed 1lb charge next to the misfired charge and detonate the new charge.

#### **b. Clearing Non-Electric Misfires.**

(1) Personnel will wait 30 minutes prior to clearing non-electric misfires.

(2) The Marine that placed the charge should be the one to clear the misfire. With that in mind, for above-ground charges, a 1lb charge should be placed next to the misfired charge. For systems that contain multiple blasting caps, each charge primed by a cap requires a 1lb charge for detonation.

(3) For a non-electric cap that has detonated but failed to initiate the remainder of the charge, a new firing system should be attached and re-fired.

(4) For buried charges, CAREFULLY remove the tamping material to within 1 foot of the charge and place a 2lb charge on top of the misfired charge and detonate the new charge.

#### b. Clearing MICLIC Misfires.

##### (1) MK155 External.

(a) Rocket does not launch: Without dismounting, verify that the rocket angle is 45 degrees. Ensure that selector switch is on rocket and attempt to re-fire. If rocket still does not launch, continue with remedial action sop. Once it is determined that the rocket is not going to launch, in order to commit to a mechanical breach, the MICLIC vehicle needs to move in a safe direction until all vehicle are clear of the SDZ (200M to rear, 400M to the front, and 800M to the flanks).

(b) Rocket launches but does not leave the rail: If the rocket does not leave the rail, it will catch the line charge on fire. If this happens, immediately attempt to drop the trailer, announce the situation over the command net, and withdraw ALL personnel beyond 1000M until after the trailer burns out or detonates.

(c) Rocket launches, charge does not detonate: Attempt to re-fire with control box. Slowly back up AAV to place tension on arresting cable (arm fuse), attempt to re-fire from control box. Attempt to manually detonate with blasting machine. Without dismounting the vehicle, continue with remedial action sop. Once all efforts short of dismounting the vehicle have been exhausted, make a complete safe system and declare a misfire over the command net- this will result in a 30 minute safety pause to allow for hangfire. During this pause, do not continue to attempt to detonate the charge as this will "reset" the 30 minute safety clock. Once the safety pause has passed, a TTECG representative, will approach the rear of the MICLIC vehicle. The TTECG representative will confer with the combat engineer

that will manually conduct the misfire procedures. The TTECG will reiterate the demolitions safety procedures prior to going downrange. The misfire kit will consist of at least 11lb of demolitions, electrically dual primed, and enough firing wire to fire the charge from the inside of the MICLIC vehicle (The misfire kit will only be primed at the direction of the TTECG representative). Once the MICLIC is primed, and the SDZ is clear, the combat engineer will be given permission to detonate the explosive by the TTECG representative. If the charge again fails to detonate, continue with electric misfire procedures.

(d) Rocket launches, cable breaks: The charge may or may not be armed, but there has been no power applied to the charge and no 30 minute safety pause is required. The TTECG representative will approach the MICLIC vehicle and proceed with the manual misfire procedures indicated in (c) above.

(e) Rocket launches, cable tangles: As long as there is at least 25M of standoff between the charge and the lead vehicle, the charge is safe to detonate- at the commander's discretion. If the commander chooses not to detonate a tangled-cable MICLIC, and the control box has not been charged, he may direct a combat engineer to make a complete safe system, then to disconnect the charge from the trailer and proceed as if the cable had broken (see (d) above).

(f) Failure to fully deploy line charge: Make a complete safe system. Examine the amount of deployment and, if necessary, remove the charge from atop the MICLIC vehicle or in the trailer. Once the charge is off of the vehicle, continue with broken cable procedures (see (d) above).

(g) Failure to detonate entire charge: Upon examination of the blast area, if any unexploded or burning explosive is discovered, remove all vehicles and personnel outside the SDZ of the MICLIC for 30 minutes. At the end of 30 minutes, re-examine, and, if no explosive is burning, and upon the direction of the TTECG representative, clear the misfire with an electric misfire kit. If explosive is still burning, wait additional 30 minute periods until the charge either detonates or goes out.

(2) (MK154 Internal). Procedures for internal and external misfires are the same except as indicated below:

(a) Rocket does not launch: Verify that the rocket angle is 42 to 63 degrees (47 degrees optimal). Ensure that selector switch is on rocket and attempt to re-fire. If rocket still does not launch, continue with remedial action sop. Once it is determined that the rocket is not going to launch, in order

to commit to a mechanical breach, the MICLIC vehicle needs to move in a safe direction until all vehicle are clear of the SDZ (200M to rear, 400M to the front, and 800M to the flanks).

(b) Rocket launches but does not leave the rail: If the rocket does not leave the rail, it may catch the line charge or the AAV on fire. If this happens, immediately announce the situation over the command net, assess the situation and decide whether to abandon the vehicle, pulling the external fire toggle, and evacuating on the engineer chase vehicle. ALL personnel and vehicles (except the burning one) must withdraw beyond 1000M until after the AAV/MICLIC burns out or detonates.

(c) Rocket launches, charge does not detonate: Attempt to re-fire with control box. Slowly back up AAV to place tension on arresting cable (arm fuse), attempt to re-fire from control box. Release the tension on arresting cable and attempt to re-fire from control box. Attempt to manually detonate with blasting machine. Without dismounting the vehicle, continue with remedial action sop. Additional procedures remain the same.

(d) Rocket launches, cable tangles: As long as there is at least 25M of standoff between the charge and the lead vehicle, the charge is safe to detonate- at the commander's discretion. If the commander chooses not to detonate a tangled-cable MICLIC, and the control box has not been charged, he may direct a crewman/ combat engineer to make a complete safe system, then to disconnect the charge from the vehicle and proceed as if the cable had broken (see (d) above).

## **U. Lasers.**

- 1) All lasers will be treated like direct fire weapons systems.
- 2) All events employing Lasers must have a designated, trained Laser Safety Officer (LSO), who has received a briefing from the MCAGCC Operations and Training (O&T) Laser Safety Officer. Laser logs will be completed and returned to the O&T LSO.
- 3) All targets to be lased must have a positive backstop (not on skyline), and the area must be free of specular reflectors.

## **B. RSO Responsibilities**



- 1) An RSO will be appointed for every TTECG controlled exercise. The RSO will not hold a tactical billet involved in the exercise. The RSO will be a completely separate assignment from the tactical exercise.
- 2) The RSO will maintain positive radio communication with BEARMAT on VHF 49.85. The RSO will use VHF 40.45 as the Exercise Safety Frequency. This frequency will be used to maintain positive communications with all road guards, firing agencies, and respective COCs and FSCCs. The RSO will position himself where he can establish and maintain optimal communications with the exercise force, supporting units, and BEARMAT. **THE RSO IS NOT AUTHORIZED TO OCCUPY OR COLLOCATE WITH RANGE CONTROL (BEARMAT).** Recommended RSO locations are listed, by event, in appendix D.
- 3) Road guards must be posted the day prior to the event at the locations specified in appendix D.
- 4) Road guards will be posted in pairs, will have two (2) radio's, a 5 gallon can of water, rations and overhead cover for shade.
- 5) The road guards will stop all traffic and notify the RSO who is in the vehicle and where they want to go. The RSO will grant or deny permission for the vehicle to proceed. Road guards are not required to stop TTECG vehicles.
- 6) The RSO/exercise force must schedule a helicopter, on the ATO, to conduct a range sweep of the training areas to be used for that exercise. The RSO will ensure the helicopter sweeps the TTECG exercise ranges first and immediately reports the results to BEARMAT. The RSO must provide a pre-flight brief to each range sweep helicopter crew prior to the execution of the range sweep flight. At a minimum, the following information and guidance will be included in the brief:
  - a. The training areas to be swept, with specific grid line delineation. For example: "The area above the 08 grid line Northing and below the 27 grid line Northing in the Quackenbush Lake training area must be swept."
  - b. Specific information as to what and who to report; For example: "All observed personnel and units not designated by the RSO as authorized, whether military or civilian, are to be reported if observed in the training areas."

- 7) The RSO must ensure that corpsmen, emergency vehicles are present and MEDEVAC procedures are known by all units.
- 8) Once the range sweep has been completed and communications established with all agencies, the RSO will request to go "HOT" from BEARMAT with the following information:
  - a. The name of the TTECG exercise for that day.
  - b. All of the training areas listed in the CAX bulletin for that exercise.
  - c. What the impact area is; bordered by 1000 meters. Usually the training areas that will actually be fired into. Example: Impact area is Quackenbush and Gays Pass bordered by 1000 meters.
  - d. That a range sweep has been conducted and the range is clear.
  - e. The weapon systems and ordnance scheduled for that exercise.
  - f. Inform BEARMAT that medical personnel and emergency vehicles are present.
  - g. That he has positive communications with all units and will maintain hourly radio checks with BEARMAT.
- 9) Once BEARMAT has cleared the range "HOT" the RSO must notify all agencies of that status.
- 10) At the completion of the exercise, the RSO must receive a confirmation from all units that all weapons have been unloaded, have been checked and been declared "Clear and Cold". The RSO will then request permission to go "COLD" from BEARMAT.
- 11) RSOs for all TTECG controlled exercises must be identified, by exercise, and a roster given to the Artillery Representative prior to 1000 on Orientation Day. These RSOs for TTECG controlled exercises must meet with the Artillery Rep immediately following the RSO Brief that is given on Orientation Day. This meeting will take place in the Artillery Rep's office.
- 12) The Artillery Representative will provide the FINEX RSO with the road guard positions 3 to 4 days prior to FINEX.

The exact time TBD, based on final FINEX scenario development.

13) Laser signs must be emplaced prior to going "HOT".

14) **The RSO needs to maintain communications with the following units during the specific exercises listed below:**

ASCEX I, ASCEX II, FSCEX I, MAC, LAR SCREEN COURSE	INF BN COC/FSCC, ARTY BATTERY, LAR 81'S (IF LAR CO IS INVOLVED), ROAD GUARDS
FSCEX II, FSCEX III, FINEX	MAGTF COC/FSCC, INF BN COC/FSCC, ARTY BN FDC, CSS ELEMENTS IN THE TRAINING AREAS, ROAD GUARDS

15) **The RSO does NOT need to maintain communications with every subordinate element in the training area (Rifle Company/ CAAT Section).** The RSO is required to maintain communications with Major Subordinate Commands. The MSC's will then maintain communications with their subordinate elements.

16) The RSO is responsible for getting the range "HOT" as soon as possible so the exercise force can start the exercise on time. The exercise force does not need to request that the RSO get the range hot, as this is the RSOs responsibility.

17) During the FINEX, the RSO should not go cold each night with BEARMAT, but should keep the range "HOT" until ENDEX. Keeping the range "HOT" will prevent delays in resuming the exercise each morning.

18) Required RSO information and an RSO checklist are provided in appendix-D.

### **C. CAX Coordinator Responsibilities**

1) The Officer Conducting the Exercise (OCE) will assign a CAX Coordinator prior to the beginning of any CAX training. The CAX Coordinator will process range scheduling requests from all elements of the exercise force, and will serve as the single point of contact between Range Scheduling and the exercise force.

- 2) The CAX Coordinator will work solely with Range Scheduling, and is not authorized direct liaison with Range Control (BEARMAT).
- 3) The CAX Coordinator, once assigned, will have no other assigned duties until the end of the CAX.

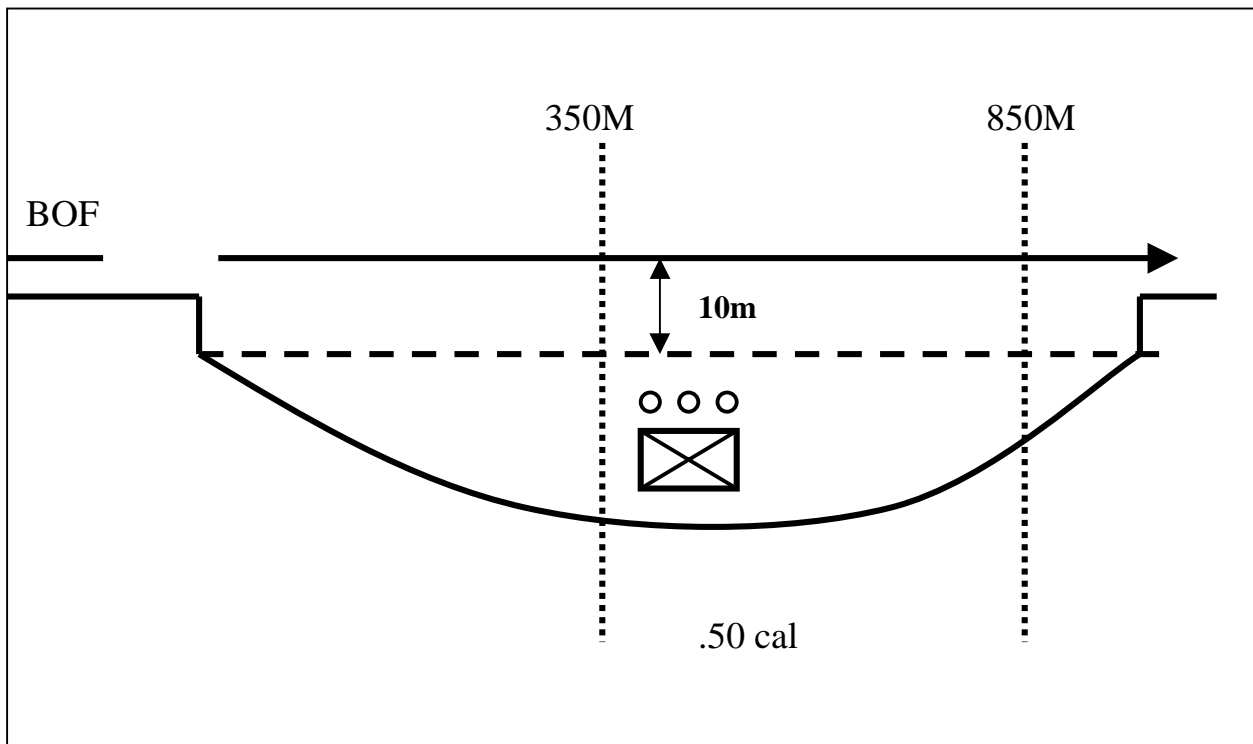
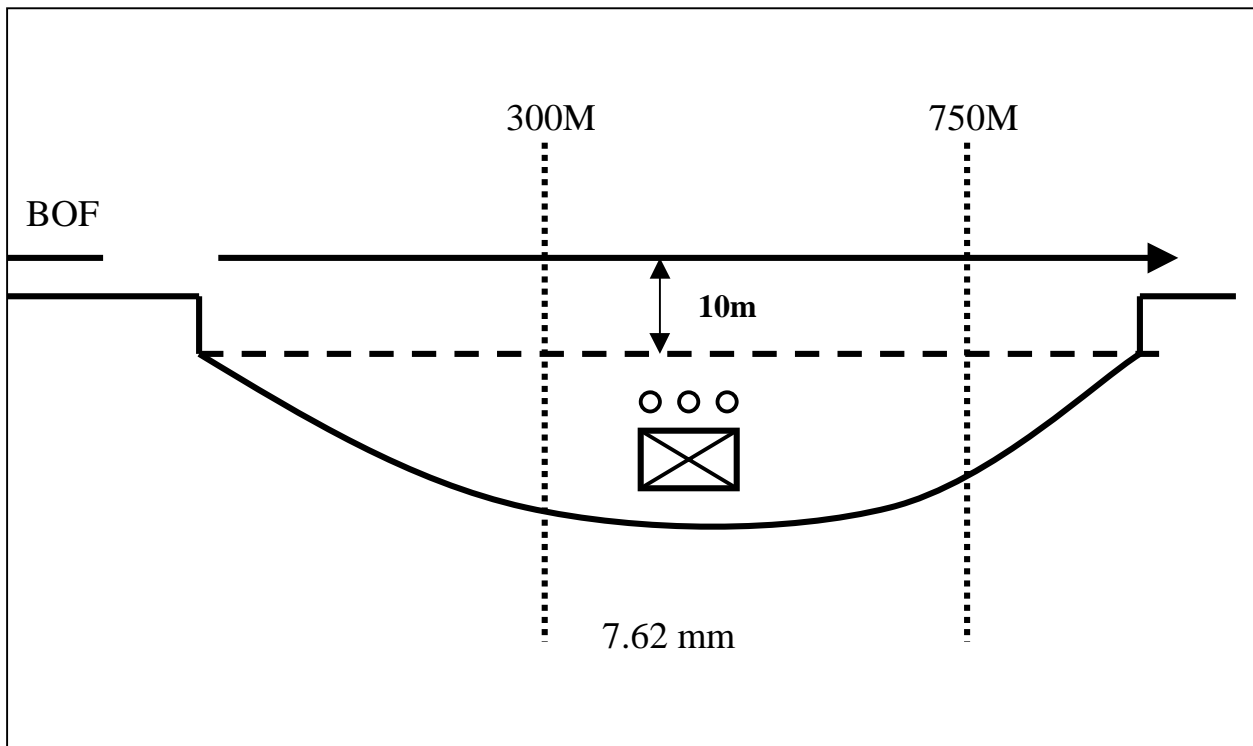
## APPENDIX A

### SURFACE FIRE DIAGRAMS

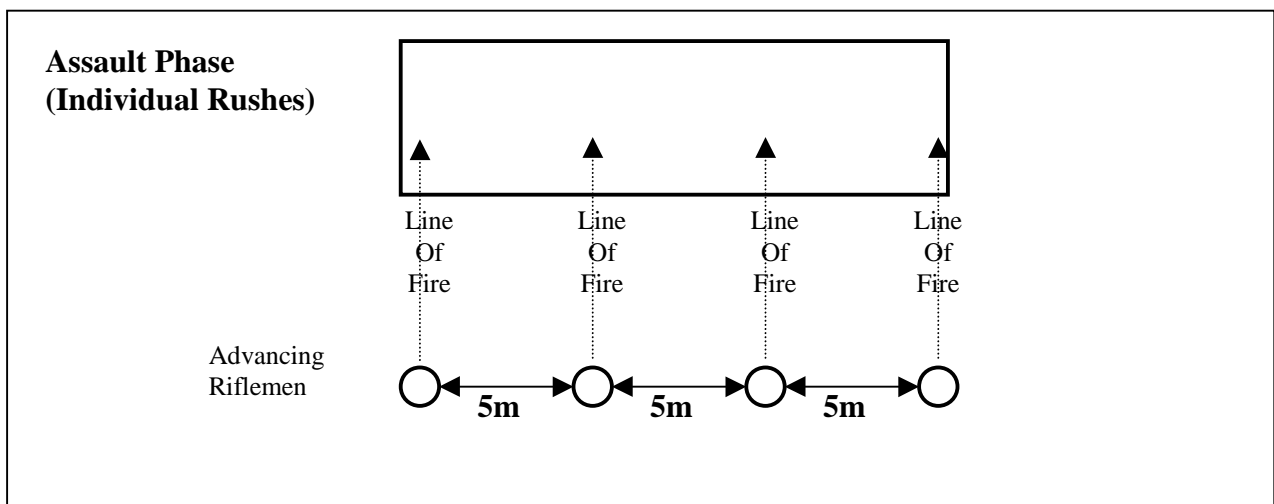
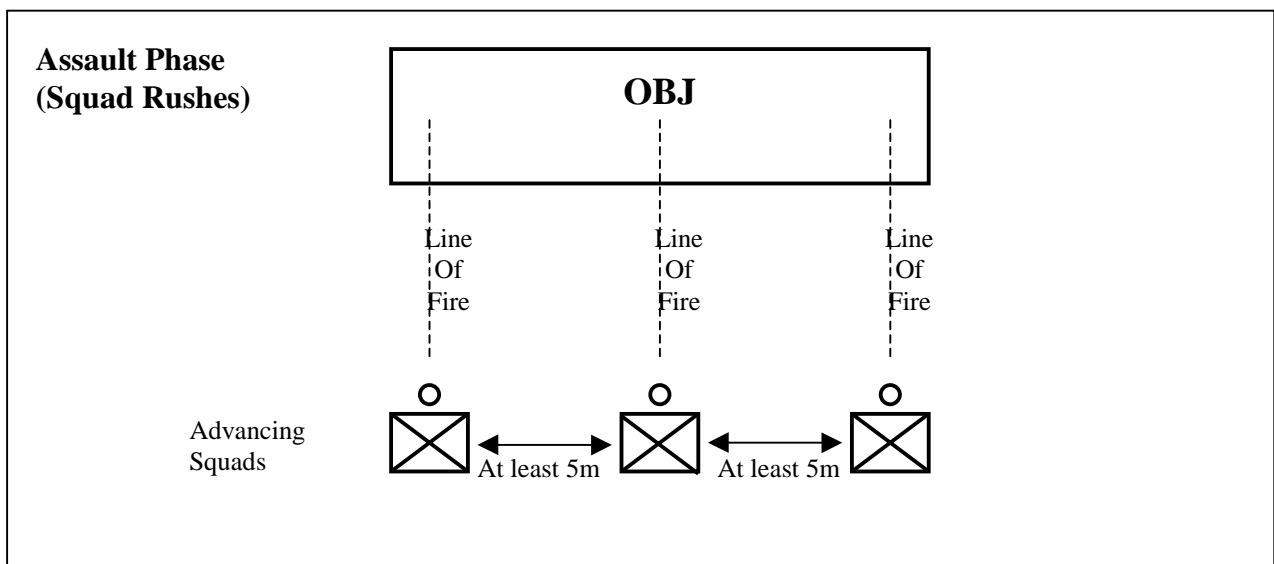
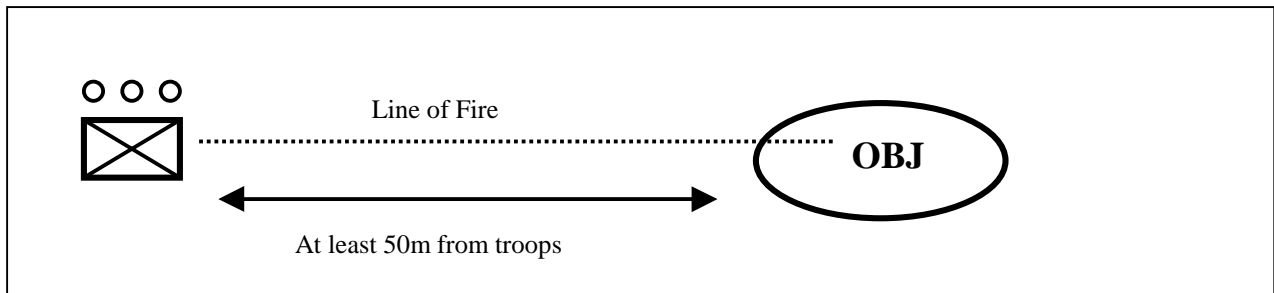
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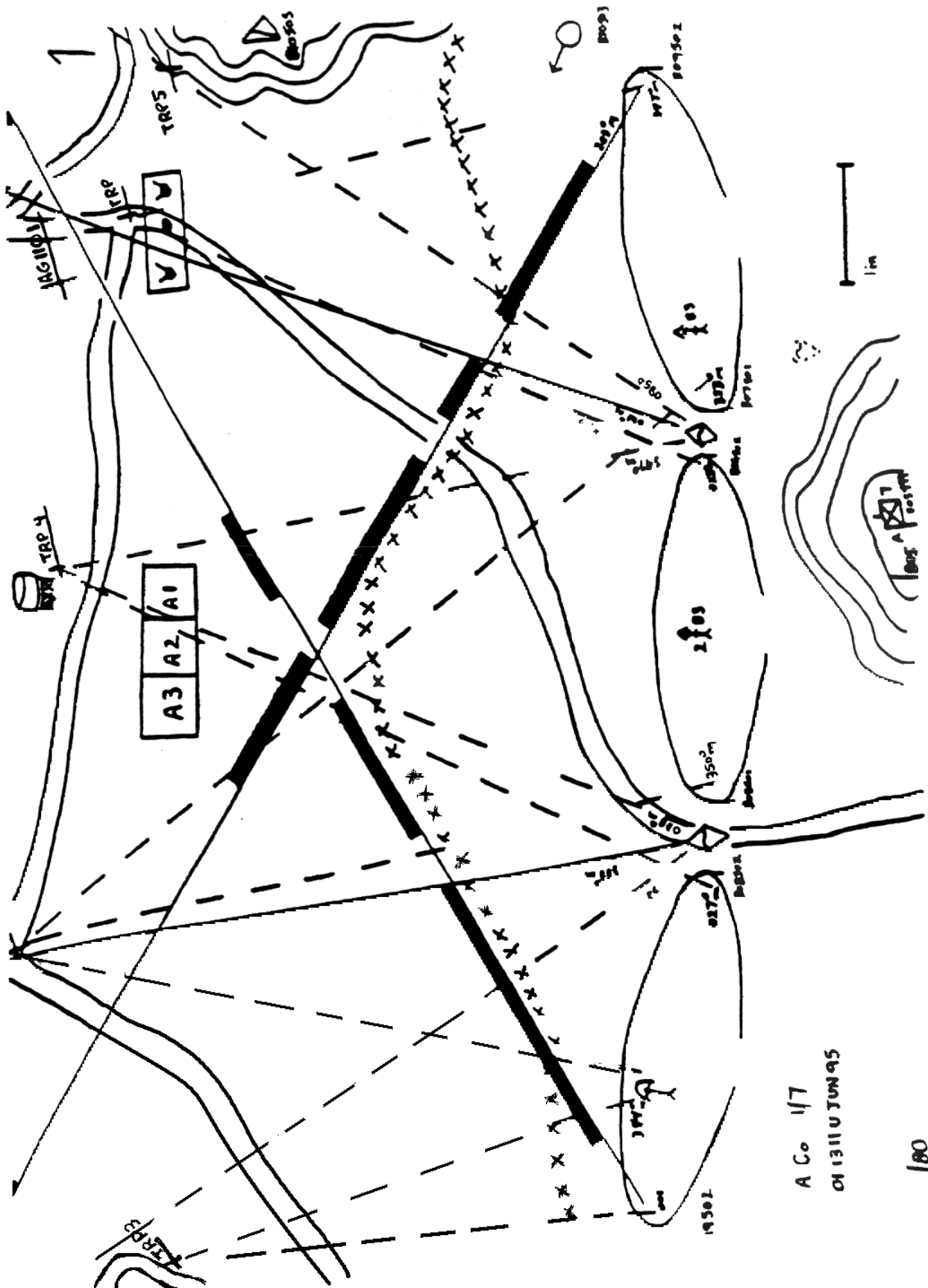
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## Overhead Fire



**A-1**





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## **FIRE PLAN SKETCH GUIDANCE**

**TASK:** Prepare a Fire Plan Sketch

**CONDITION:** A company has consolidated on the objective or occupied a defensive position

**STANDARDS:**

1. Terrain features incidental to defense of the position are depicted.
2. Locations of early warning outposts and devices are depicted.
3. Sketch is to scale and all locations and directions are within usable tolerances (30 meters and 1 degree)
4. Locations and sectors of fire of all automatic weapons, to include PDF's and FPL's, and anti-tank weapons are depicted.
5. Gaps in early warning systems and dead space in organic weapons fires are covered and depicted.
6. Preplanned fires on each avenue of approach are depicted for rapid identification.
7. Locations of wire and engineer obstacles, to include mines and booby traps, are depicted.
8. Sketch is constructed using correct military symbols.
9. Range cards for crew served weapons are prepared and accompany fire plan sketch.
10. All sectors of fire, PDF's and FPL's directions are labeled in degrees magnetic.
11. Left and right flanks of platoon positions, mortars, company CP and OP's/LP's are labeled with grid coordinates.
12. Target reference points are depicted.
13. Hot and cold positions of anti-tank weapons, CAAT vehicles, attached AAV's are depicted.
14. Distance scale is depicted.
15. Defensive position down to platoon level are depicted.

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## APPENDIX B

### IMMEDIATE ACTION PROCEDURES

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## **I. M-16A2 Rifle**

### **IMMEDIATE ACTION**

- a. Tap upward on the magazine to ensure it is properly seated.
- b. Pull the charging handle fully to the rear. Observe for ejection of case or cartridge. Check chamber for obstruction.
- c. If a cartridge or case is ejected or chamber is clear, release charging handle to feed a new round. Tap bolt closing forward assist assembly to ensure bolt closure. Attempt to fire the rifle.
- d. If a cartridge or case is not ejected, a failure to extract or feed has occurred. Check for round in chamber. If chamber is empty, change magazine, reload and attempt to fire the rifle.
- e. If a cartridge is ejected, it may indicate a dented round, a broken firing pin, hammer spring or bolt closure failure.

## **II. M203 Grenade Launcher**

### **IMMEDIATE ACTION**

a. Shout "MISFIRE", keep the weapon trained on the target, and all troops clear of the muzzle.

**WARNING:** Before attempting to remove the round from the grenade launcher, personnel not required for the operation must be cleared from the vicinity.

b. Wait 30 seconds from the time of failure to fire before opening the breach for unloading procedures.

c. Exercise extreme caution during unloading procedures; where circumstances permit, either catch the ejected round or reduce the distance of free fall to ground.

d. After the round has been removed from the receiver, determine whether the round or the firing mechanism is defective. Examine the primer to see if it has been dented. If the primer has not been dented, the firing mechanism is at fault. The round may be reloaded and fired after the cause of the failure to fire has been corrected.

e. If the primer has been dented, keep the round separate from other ammunition until it can be properly disposed of.

### III. SAW

#### IMMEDIATE ACTION

a. If the weapon stops firing charge the weapon and push the cocking handle forward until you hear it click.

b. If a round is ejected, fire again.

c. If nothing is ejected and barrel is hot (200 rds fired within a 2 min period), do not open the cover, push safety to right (red ring not visible) keep machine gun pointed down range and remain clear for 15 minutes. Then clear the machine gun.

d. If nothing is ejected and an ammo belt is being used, look to see if the cartridge indicator is in the lower (down) position. If it is; no rounds remain in the feed tray and you have ran out of belted ammo. If the cartridge indicator is in the up position and the barrel is not hot clear weapon.

e. If nothing is ejected and the alternate magazine feed is being used, and barrel is not hot, clear weapon.

f. If immediate action doesn't work: Be sure the weapon is clear and check for obstructions, lubrication and dirt. Reload, and fire again.

#### IV. M60-E3 / M-240 G

##### IMMEDIATE ACTION

1. Wait 5 seconds.
2. Pull bolt to the rear.
3. Observe ejection port.
  - a. If round is ejected, attempt to fire.
  - b. If round is not ejected:
    - (1) Assume a live round is in the chamber. Put safety on safe.
    - (2) Determine "hot" or "cold" status: Hot = 200rds within 2 min

##### (a) Cold Barrel Procedures

1. Raise cover, remove ammo & links, inspect chamber. If clear, reload & attempt to fire. If brass is present, execute "clear gun", reload, and attempt to fire.
2. If weapon fires, continue mission.
3. If weapon does not fire: repeat cold gun procedure, then perform subsequent action (field strip & LTI)

##### (b) Hot Barrel Procedure

1. Wait at least 15 min
2. Perform cold barrel procedures.

## V. M-2HB MACHINE GUN

### IMMEDIATE ACTION

1. Wait 5 seconds.
2. Pull bolt to rear.
3. Observe objection port for the following:
  - (a) If round is ejected, attempt to fire. If weapon fires continue mission.
  - (b) If round is not ejected, assume live round in chamber, put weapon on semi auto. Determine "Hot or Cold" barrel: Hot=150 rds within 2 min.
4. Cold barrel procedures:
  - (a) Raise cover, remove ammunition inspect weapon. If clear, reload and attempt to fire. If weapon fires, continue mission.
5. Hot barrel procedures:
  - (a) Wait 15 minutes.
  - (b) Perform cold barrel procedures.



## **VI - MK19 40MM MACHINE GUN**

### **Immediate Action.**

1. Clear the area of all personnel and put the weapon on safe.
2. Wait 10 seconds.
3. Pull bolt to rear, catch round as it is ejected.

### **WARNING**

**If immediate action of a stoppage (bolt forward) results in the extraction of a spent cartridge, the crew will initiate subsequent action for a suspected obstruction in the barrel (round removal tool) before attempting to fire again.**

4. Push charger handles forward and up.
5. Attempt to fire.
6. If weapon fires, continue mission.

## VII. AT-4

Immediate Action.

In the event the AT-4 fails to fire:

1. Keep weapon pointed down range for 30 seconds.
2. Re-cock the weapon
3. Depress safety
4. Press trigger
5. If rocket still fails to fire, keep pointed down range another 30 seconds.
6. Secure safety catch and cocking lever.
7. Replace transport safety pin, and return to ammunition supply point.

## VIII. SMAW

### 1. SPOTTING RIFLE MALFUNCTION

- a. Safety lever to fire
- b. Eject defective cartridge
- c. Reseat bolt, attempt to fire.
- d. Reseat magazine
- e. Reseat bolt, attempt to fire

If rifle does not feed, obtain another magazine and continue mission

### 2. LAUNCHER MALFUNCTION

- a. Keep aimpoint on target, wait 15 seconds
- b. Release launch lever and trigger, set safety to SAFE
- c. Reset charge lever to CHARGE
- d. Reset safety lever to FIRE
- e. Reestablish aimpoint, depress launch lever & squeeze trigger

#### IF ROUND DOES NOT FIRE

- a. Keep aimpoint on target, wait 15 seconds
- b. Release launch lever and trigger, set safety to SAFE
- c. Remove round, rotate 1/2 turn and remate
- d. Attempt third firing

#### IF ROUND DOES NOT FIRE

- a. Keep aimpoint on target, wait 15 seconds
- b. Release launch lever and trigger, set safety to SAFE
- c. Remove round, place on ground pointed in a safe direction
- d. Notify EOD. The unit will maintain physical custody of the rocket until EOD arrives to destroy it in place.

## **IX. M-47 Dragon**

### **DRAGON MISFIRE PROCEDURES**

Missile fails to fire:

1. Announce "misfire"
2. Continue to track target. Resqueeze trigger.
3. If missile fails to fire, feel near tracker battery.

If battery is hot:

1. Wait 5 minutes with round on shoulder and muzzle pointed down range.
2. If missile fails to fire, remove tracker and carefully lay round on ground. Ensure neither Marine exposes himself to the backblast or the front of the tube. Keep round pointed at the target.
3. Notify EOD
4. Obtain another round and continue mission.

If battery is cold:

1. Loosen then remate tracker to round. Acquire target and squeeze trigger.
2. If missile fails to fire, remove tracker and carefully lay round on ground. Ensure neither Marine exposes himself to the backblast or the front of the tube. Keep round pointed at the target / in a safe direction.
3. Notify EOD. The unit will maintain physical custody of the missile until EOD arrives to destroy it in place.

## **X. M220 TOW**

1. FAILURE TO FIRE, PREFIRE PRESENT
  - a. Gunner announces "hangfire"
  - b. Gunner tracks target for 1 minute
  - c. If missile fails to launch after one minute, lower arming lever
  - d. Gunner locks down system in direction of target.
    - Elevation lock in
    - Azimuth lock in
  - e. Wait 30 minutes
  - f. Raise bridge clamp
  - g. Remove missile from launch tube, keep missile pointed in a safe direction
  - h. Place in dud pit, or at least 200 meters from personnel
  - i. Notify EOD. The unit will maintain physical custody of the missile until EOD arrives to destroy it in place.
2. FAILURE TO LAUNCH, PREFIRE ABSENT
  - a. Gunner announces "misfire"
  - b. Gunner tracks target for 1 minute
  - c. Conduct missile guidance set self test for battery, replace if battery fails
  - d. On missile guidance set, make sure coil cord is attached to J-1
  - e. Ensure bridge clamp locking handle is seated
  - f. Lower arming lever
  - g. Check backblast area
  - h. Raise arming lever
  - i. Attempt to fire
  - j. If missile fails to launch, track target for 1 minute
  - k. Lower arming lever
  - l. Close trigger cover
  - m. Gunner locks down system in direction of target.
    - Elevation lock in
    - Azimuth lock in
  - n. Wait 30 minutes
  - o. Raise bridge clamp
  - p. Remove missile from launch tube, keep missile pointed in a safe direction
  - q. Place in dud pit, or at least 200 meters from personnel
  - r. Notify EOD. The unit will maintain physical custody of the missile until EOD arrives to destroy it in place.

## **XI 60mm Mortar**

### **MISFIRES**

- a. Causes. A misfire (mechanical malfunction) is a complete failure to fire. Misfires can be caused by a faulty mechanism or faulty element in the propelling charge explosive train. All firing malfunctions must be considered a misfire. Mechanical malfunctions can be caused by a faulty firing pin; rounds lodged in the barrel due to burrs, excessive paint, oversized rounds, foreign matter in the barrel; misplaced obturating ring; defective ignition cartridge; or excessive oil or water in the bore.
- b. Steps for removing Misfires:
  - (1) When a Misfire occurs, any squad member immediately announces “Misfire”. All personnel except the Gunner and A/Gunner move 50 meters to the rear of the mortar. If it is obvious to the Squad Leader that the round has reached the bottom of the barrel and it has failed to fire, the Gunner places the selector switch on trigger fire (Charge 2 or less) and squeezes the trigger several times to try to clear the round. If the round fails to fire on trigger fire, the Gunner places the selector switch on drop fire and assumes his normal firing position. The A/Gunner then kicks the barrel several times with his heel in an attempt to dislodge the round. If the round fails to fire after trigger firing, and kicking, the Gunner places the selector switch on safe. If the round fires, the mortar is re-laid on the aiming post and firing is continued.
  - (2) If the round does not fire, the Gunner test the barrel for heat. If the barrel is cool enough to handle, the crew removes the round as described below. If the barrel is hot, the Gunner may then apply water to the outside of the barrel until it is cool. If water is not available, the Gunner and A/Gunner must stand clear of the mortar until the barrel is cool.
  - (3) Round removal: (Conventional Mode)
    - (a) The Gunner removes the sight and lowers the barrel to its minimum elevation and backs off one-quarter turn. The A/Gunner unlocks the barrel from the baseplate by loosening the locking knob until the barrel can be rotated. He rotates the barrel 90 degrees in the socket cap so that the flats on the barrel are aligned with the flats of the socket cap.
    - (b) The Gunner grasps both ends of the traverse screw assembly and supports the mortar during the subsequent drill. The A/Gunner with his left leg in front of the nonmechanical leg of the bipod, places his left hand near the top of the barrel and his right hand on the underside,

just below the muzzle. The first ammunition bearer puts both hands on the cooling fins under the barrel and slowly lifts the barrel until it is horizontal. He must not stand directly behind the mortar.

- (c) When the barrel reaches the horizontal position, and not before, the A/Gunner moves the thumb of each hand over muzzle. When the fuze of the misfired round reaches the muzzle, the A/Gunner stops the round with his thumbs (he does not touch the fuze) and carefully removes it from the barrel. The first ammunition bearer shakes the barrel to dislodge and remnants from the last round fired, and he lowers the barrel into the socket cap of the baseplate.
- (d) The A/Gunner passes the round to the first ammunition bearer who inspects it for the cause of the misfire. If the primer of the ignition cartridge is dented, he attempts to replace the safety wire and places the round in a marked, safe location for turn-in/disposal by ordnance personnel. If the primer is not dented, the round may be used again. The selector switch is placed on drop fire and the bore is swabbed.
- (e) If the above procedure fails to remove the misfire, the barrel must be kept horizontal, removed from the bipod and laid horizontally on the ground at the dud pit until it can be turned over to ordnance personnel.

#### (4) Round removal: (Handheld Mode)

- (a) The Gunner immediately pulls the trigger twice. If the round still fails to fire, he announces "Misfire". The Gunner places the selector switch on SAFE and bounces the mortar from at least 6 inches off the ground to dislodge the round. (Disregard if the crew heard the round strike the bottom of the barrel.
- (b) The Gunner places the selector switch back on trigger fire and squeezes the trigger twice. If the round still does not fire, he places the selector switch on SAFE and supports the mortar barrel with sand bags or empty ammo boxes to keep the mortar barrel upright and stable.
- (c) If the barrel is hot, the Gunner cools it with water and rechecks for heat. Once the barrel is cool, the A/Gunner places his left hand near the top of the barrel and his right hand on the underside just below the muzzle. The Gunner lifts the base of the mortar with the M8 baseplate to the horizontal position. Once the barrel is raised above the horizontal position, the A/Gunner stops the round when the fuze of the misfired round reaches the muzzle.

- (d) The A/Gunner passes the round to the ammunition bearer who inspects it for the cause of the misfire. If the primer of the ignition cartridge is dented, he attempts to replace the safety wire and places the in a marked safe location for turn-in/disposal by ordnance personnel. If the primer is not dented, the round may be used again. The selector switch is placed on trigger fire and the bore in swabbed.

## **WARNING**

**WHEN MORTARS ARE FIRED IN SUPPORT OF MANEUVER AND A MISFIRE OCCURS, NO IMMEDIATE ACTION WILL BE INITIATED UNTIL THE MANEUVER IS COMPLETED AND THE TROOPS ARE OUT OF THE IMPACT AREA.**

B-12



## **XII. 81mm Mortar**

### **MISFIRES**

- a. Causes. A misfire (mechanical malfunction) is a complete failure to fire. Misfires can be caused by a faulty mechanism or faulty element in the propelling charge explosive train. All firing malfunctions must be considered a misfire. Mechanical malfunctions can be caused by a faulty firing pin; rounds lodged in the barrel due to burrs, excessive paint, oversized rounds, foreign matter in the barrel, misplaced obturating ring, defective ignition cartridge, or excessive oil or water in the bore.
- b. Steps for removing misfires
  - 4) When a misfire occurs, any squad member immediately announces "Misfire". All personnel except the Gunner and A/Gunner move 50 meters to the rear of the mortar. The Gunner assumes his normal firing position. The A/Gunner then kicks the barrel several times with his heel in an attempt to dislodge the round. If the round fires, the mortar is re-laid on the aiming post and firing is continued.
  - 5) If the round does not fire, the Gunner tests the barrel for heat. If the barrel is cool enough to handle, the crew removes the round as described below. If the barrel is hot, the Gunner may then apply water to the outside of the barrel until it is cool. If water is not available, the Gunner and A/Gunner must stand clear of the mortar until the barrel is cool.
  - 6) Round Removal:
    - a. The Gunner removes the sight and firing pin. The Gunner unlocks the barrel clamp and rotates the barrel, unlocking the breech plug from the rotating socket of the baseplate. He then relocks the barrel.
    - b. The Gunner grasps both ends of the traverse screw assembly and supports the mortar during the subsequent drill. The A/Gunner places his right hand palm up (1 inch from the muzzle end) under the BAD and his left hand palm down (1 inch from the muzzle end) on top. The first ammunition bearer puts both hands on the cooling fins under the barrel and slowly lifts the barrel until it is horizontal. He must not stand directly behind the mortar.

- c. When the barrel reaches the horizontal position, and not before, the A/Gunner moves the thumb of each hand over the muzzle. When the fuze of the misfired round reaches the BAD, the A/Gunner stops the round with his thumbs (he does not touch the fuze) and carefully removes it from the barrel. The first ammunition bearer shakes the barrel to dislodge the remnants from the last round fired, he lowers the barrel into the rotating socket of the baseplate.
- d. The A/Gunner passes the round to the first ammunition bearer who inspects it for the cause of the misfire. If the primer of the ignition cartridge is dented, he attempts to replace the safety wire and places the round in a marked, safe location for turn-in/disposal by ordnance personnel. If the primer is not dented, the round may be used again. The firing pin must be replaced and the bore swabbed.
- e. If the above procedure fails to remove the misfire, the barrel must be kept horizontal, removed from the bipod and laid horizontally on the ground at the dud pit until it can be turned over to ordnance personnel.

#### **WARNING**

**WHEN MORTARS ARE FIRED IN SUPPORT OF MANEUVER AND A MISFIRE OCCURS, NO IMMEDIATE ACTION WILL BE INITIATED UNTIL THE MANEUVER IS COMPLETED AND TROOPS ARE OUT OF THE IMPACT AREA.**

### **XIII. DEMOLITIONS**

#### **ELECTRIC MISFIRES**

##### **a. Clearing Electric Misfires.**

(1) Check the firing wire connection to the blasting machine or power source terminals to be sure that the contacts are good.

(2) Inspect blasting machine or power source, replace if necessary.

(3) Make two more attempts to fire the circuits.

(4) Disconnect the firing wire from the blasting machine and shunt the ends to avoid any possible static electric detonation. Move forward to investigate the source of the misfire. The blasting machine or power source is taken forward when the charge site is checked.

(5) Check the entire circuit for breaks or shorts in the wire. Tape or splice if required.

(6) If no problems are discovered with the firing wire, test the blasting cap and replace if necessary.

#### **XIV. JAVELIN MISFIRE PROCEDURES**

1. Failure to fire, No Warning Indicator.
  - a. Release triggers
  - b. Re-engage target
  - c. If still fails:
    - Release triggers
    - Turn off Control Launch Unit (CLU)
    - Ground Javelin
    - Remove CLU
    - Reconnect CLU to same round
    - Turn on CLU
    - Continue Mission
  - d. If still fails:
    - Release triggers
    - Turn off CLU
    - Ground Javelin
    - Disconnect CLU from round
    - Move round 25 meters
    - Connect CLU to replacement round
    - Turn on CLU
    - Continue Mission
2. Failure to fire, Missile BIT flashing.
  - a. Release triggers
  - b. Re-engage target
  - c. If still fails:
    - Release triggers
    - Turn off Control Launch Unit (CLU)
    - Ground Javelin
    - Remove CLU
    - Reconnect CLU to same round
    - Turn on CLU
    - Continue Mission
  - d. If still fails:
    - Release triggers
    - Turn off CLU
    - Ground Javelin
    - Disconnect CLU from round
    - Move round 25 meters
    - Connect CLU to replacement round
    - Turn on CLU
    - Continue Mission
3. Failure to Fire, Missile BIT Failure (Indicator On)
  - a. Turn off CLU
  - b. Ground Javelin
  - c. Keep pointed at target
  - d. Remove CLU

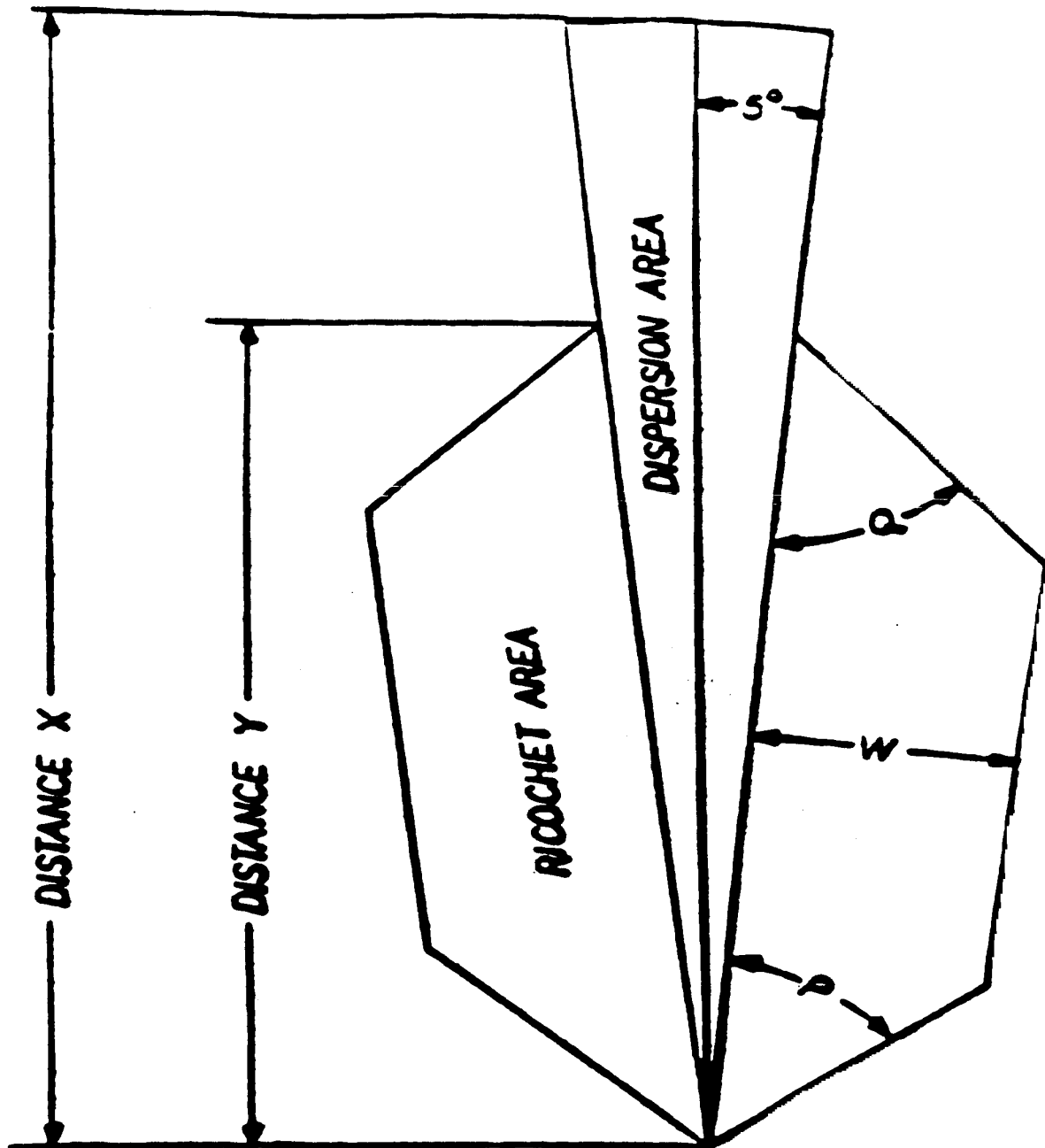
- e. Move round 25 meters
  - f. Obtain replacement round
  - g. Connect CLU to replacement round
  - h. Turn on CLU
  - i. Continue Mission
4. Failure to fire, Hangfire.
- a. Release triggers
  - b. Keep pointed down range for 60 seconds
  - c. Turn off CLU
  - d. Ground Javelin
  - e. Remove CLU from round
  - f. Move round 25 meters from Gunners position
  - g. Connect CLU to a replacement round
  - h. Turn on CLU
  - i. Repeat steps to engage target
  - j. Continue Mission

## APPENDIX C

### SURFACE AREA DANGER DIAGRAMS

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SURFACE DANGER ZONE DIMENSIONS  
FOR DIRECT FIRE WEAPONS



# SURFACE DANGER ZONE DIMENSIONS DIRECT FIRE WEAPON SYSTEMS

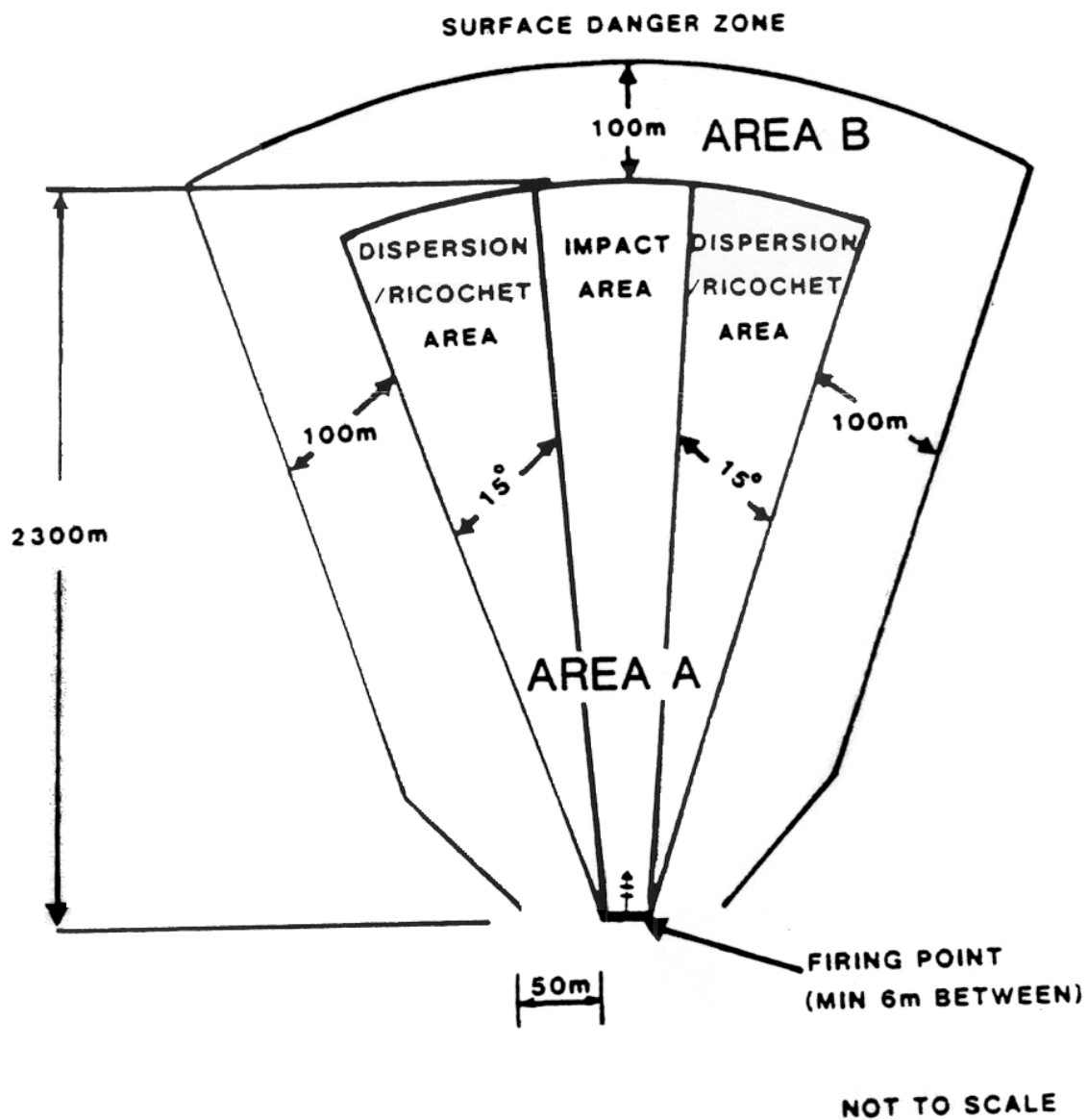
<u>CALIBER</u>	<u>IMPACT</u> <u>MEDIA</u>	<u>DIST X</u> (.....METERS.....)	<u>DIST Y</u>	<u>AREA W</u>	<u>VERT HAZ</u>	<u>ANGLE / DEGREES</u>	
						<u>2</u>	<u>2</u>
12 Gage	Earth	1073	710	129	136	21.96	33.34
00	Water	1073	710	129	136	21.96	33.34
Slug	Steel	1073	830	287	197	36.91	40.17
	Concrete	1073	830	287	197	36.91	40.17
.22 Cal	Earth	1400	1033	159	96	24.00	15.90
Long	Water	1400	1033	159	96	24.00	15.90
Rifle	Steel	1400	1125	386	245	63.40	30.30
M24	Concrete	1400	1125	386	245	63.40	30.30
.38 Cal	Earth	1806	1110	153	89	22.57	16.07
M&1	Water	1806	1110	153	89	22.57	16.07
Ball	Steel	1806	1250	389	245	60.95	35.36
	Concrete	1806	1250	389	245	60.95	35.36
9mm	Earth	1800	1077	150	93	23.10	15.80
M&02	Water	1800	1077	150	93	23.10	15.80
Ball	Steel	1800	1211	399	253	61.10	30.40
	Concrete	1800	1211	399	253	61.10	30.40
.45 Cal	Earth	1690	1016	117	100	21.11	16.69
M1911	Water	1690	1016	117	100	21.11	16.69
Pistol/	Steel	1690	1111	290	186	54.74	30.77
SMG	Concrete	1690	1111	290	186	54.74	30.77
9.56mm	Earth	3100	2004	450	319	35.20	23.10
M193	Water	3100	2004	450	319	35.20	23.10
Ball	Steel	3100	1666	323	219	19.00	26.90
	Concrete	3100	1666	323	219	19.00	26.90
9.56mm	Earth	3100	2066	514	359	35.10	26.80
M196	Water	3100	2066	514	359	35.10	26.80
Tracer	Steel	3100	2023	362	243	19.20	22.80
	Concrete	3100	2023	362	243	19.20	22.80
9.56mm	Earth	3437	2029	462	325	34.20	22.40
M&55	Water	3437	2029	462	325	34.20	22.40
Ball	Steel	3437	1810	334	229	18.80	25.20
	Concrete	3437	1810	334	229	18.80	25.20
9.56mm	Earth	3089	1607	355	261	32.80	23.20
M&56	Water	3089	1607	355	261	32.80	23.20
Tracer	Steel	3089	1592	277	261	18.60	21.00
	Concrete	3089	1592	277	261	18.60	21.00



# SURFACE DANGER ZONE DIMENSIONS DIRECT FIRE WEAPON SYSTEMS

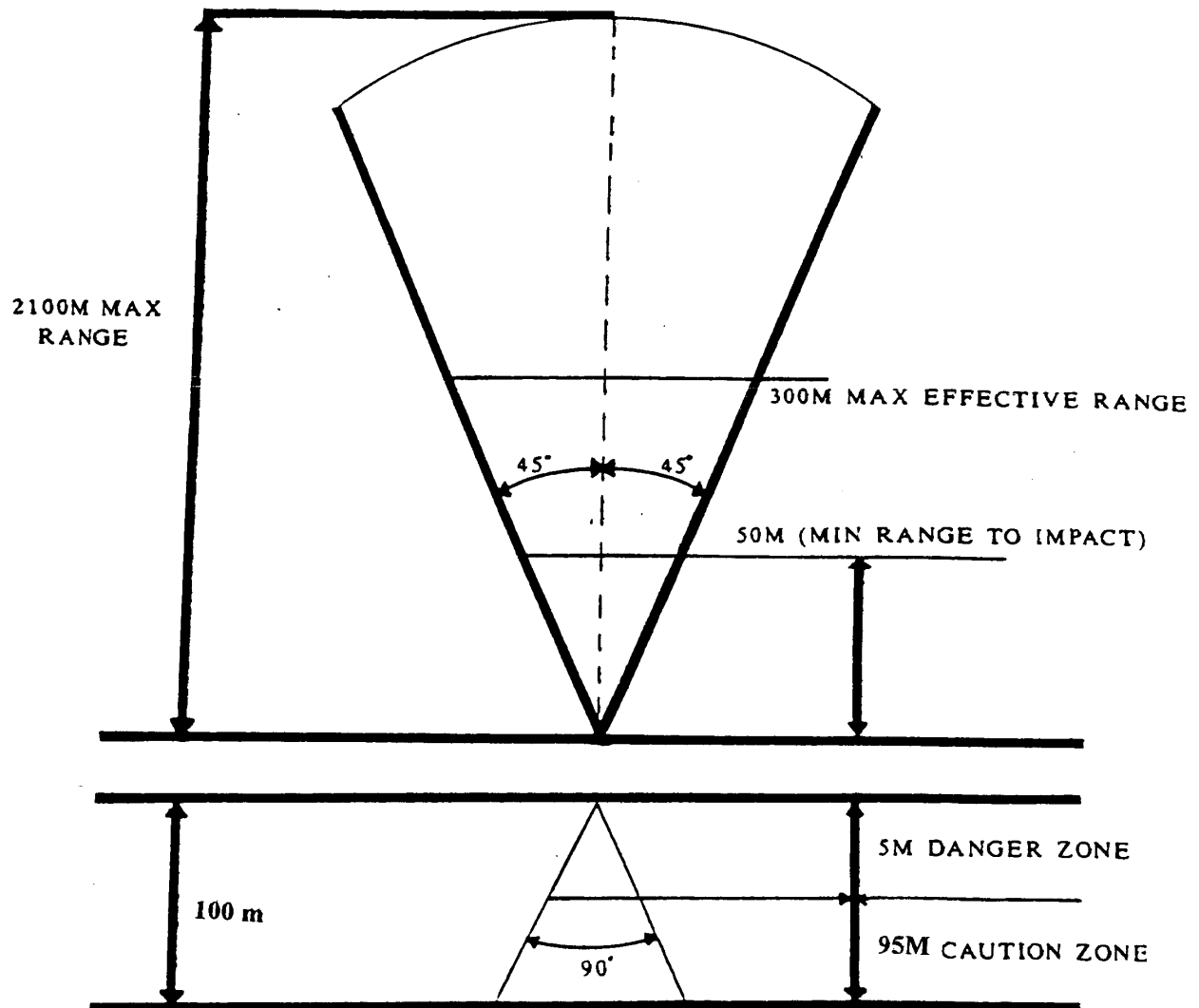
CALIBER	IMPACT MEDIA	DIST X	DIST Y	AREA	VERT -42	ANGLE (DEGREES)	
		.....	.....	.....	.....	.....	.....
5.56mm	Earth	250	165	24	16	15.40	20.00
M862	Water	250	165	24	16	15.40	20.00
Plastic	Steel	250	136	5	4	3.30	7.30
	Concrete	250	136	5	4	3.30	7.30
7.62mm	Earth	5280	4800	1545	752	43.81	38.73
M118	Water	5280	4800	1545	752	43.81	38.73
Special	Steel	5280	5137	990	490	20.17	41.29
	Concrete	5280	5137	990	490	20.17	41.29
7.62mm	Earth	4100	4073	1461	706	43.54	38.90
M80	Water	4100	4073	1461	706	43.54	38.90
Ball	Steel	4100	4053	861	447	20.04	75.54
	Concrete	4100	4053	861	447	20.04	75.54
.50 Cal	Earth	6100	5142	1639	904	40.80	69.60
M2	Water	6100	5142	1639	904	40.80	69.60
AP	Steel	6100	4300	710	462	16.30	33.10
	Concrete	6100	4300	710	462	16.30	33.10
.50 Cal	Earth	6500	5211	1652	901	38.19	63.35
M2	Water	6500	5211	1652	901	38.19	63.35
Ball	Steel	6500	4147	714	478	16.03	44.13
	Concrete	6500	4147	714	478	16.03	44.13
20mm	Earth	3940	3340	581	317	25.83	22.83
M220	Water	3940	3040	558	311	26.08	30.96
TP-T	Steel	3940	3290	804	513	36.66	47.76
	Concrete	3940	3260	763	447	34.33	34.09
20mm	Earth	4230	3537	685	360	26.73	39.83
M246	Water	4230	3316	716	354	29.81	39.87
HEI-T-SD	Steel	4230	3937	991	590	38.63	38.58
	Concrete	4230	3750	952	513	34.99	50.31
20mm	Earth	4500	3780	733	357	25.74	33.20
M55A2	Water	4500	3500	737	350	26.16	36.66
TP	Steel	4500	4053	1025	585	38.14	36.82
	Concrete	4500	3750	969	509	34.12	37.78

# MK-19



C-4

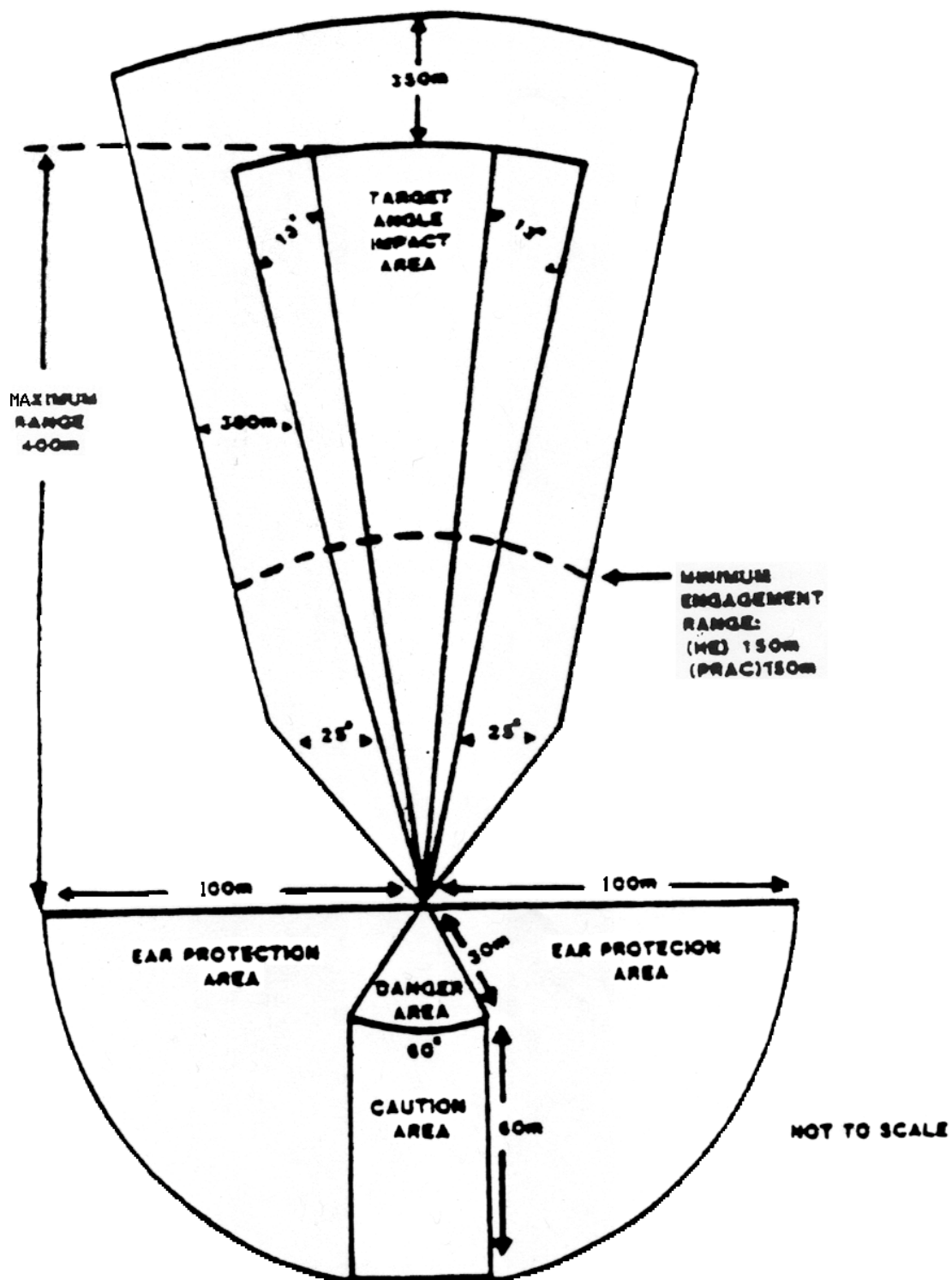
# AT-4 SURFACE DANGER DIAGRAM



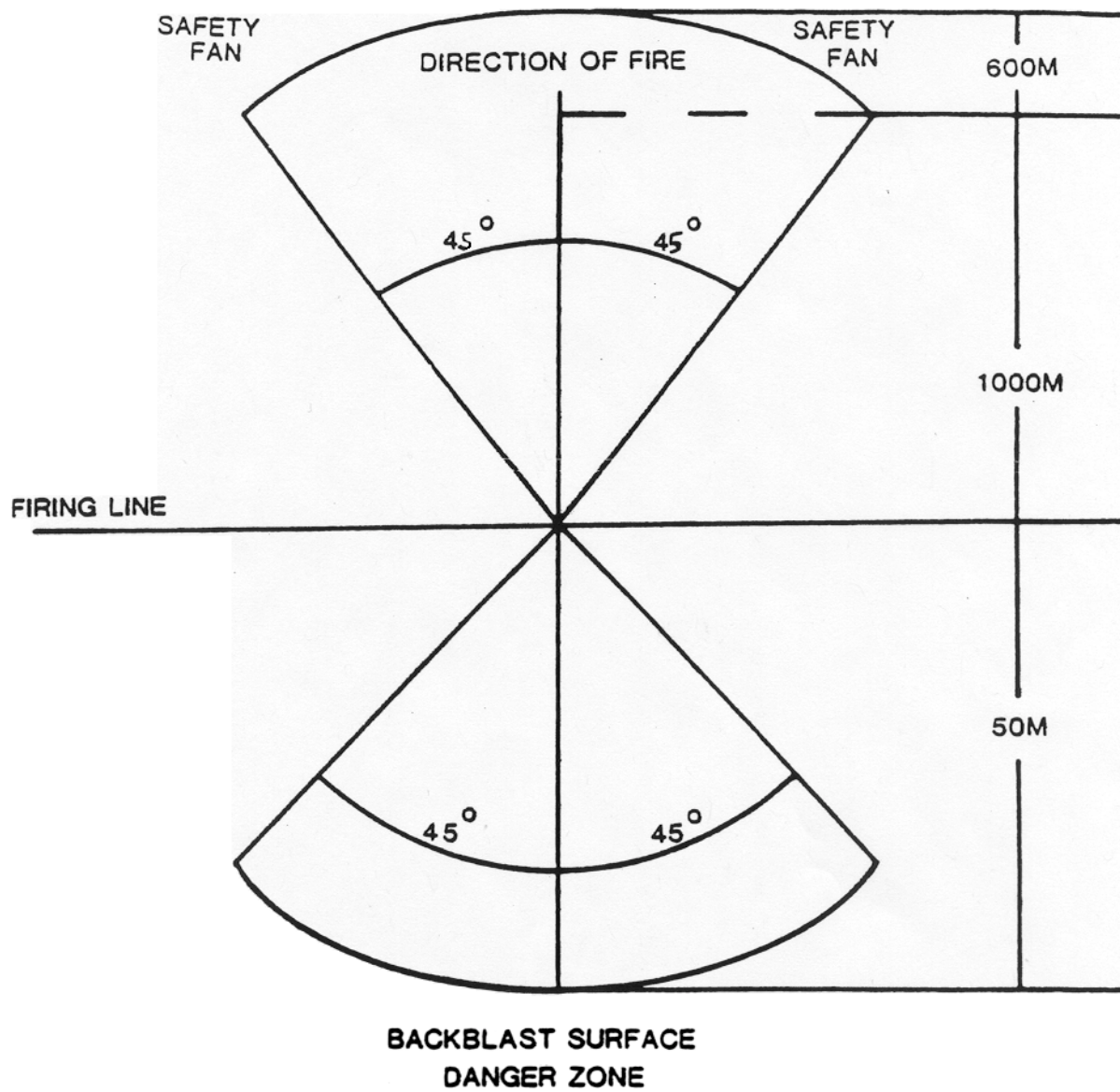
C-5

# SMAW

## SURFACE DANGER ZONE



C 6



**DRAGON - SURFACE DANGER AREA**

**C-7**

## TOW SURFACE DANGER ZONE

The following SDZ diagram is for the Basic TOW, Improved TOW (ITOW), TOW 2, TOW 2A and TOW 2B missiles for firing at fixed and moving targets. This figure represents a modified 1:1,000 probability diagram of a hazardous fragment escaping the SDZ. Area H (not shown) is waived for TTECG sponsored events. The SDZ parameters are as follows:

1. Area A and Area B are Secondary Fragment Areas

	Area A	Area B
Inert Warhead	100 m	100 m
High Explosive Warhead	750 m	750 m

2. Area I is a circular sector immediately in front of the launcher position with a radius of 800 m. It is measured 47 degrees off of either side of the gun target line.

3. Distance D and Distance X vary in accordance with the range of the target engaged.

Ground Launch Mode	Maximum Distance Shot
Distance X	4400 m
Distance D	3400 m

4. The Backblast Area is the danger area center on and extending to the rear of the launcher.

### Ground Launch

a. The Primary Danger area is a 90 degree cone (45 degrees either side of the gun target line) at the rear of the launcher with a radius of 50 m. Serious casualties or fatalities are likely to occur to any personnel in this area during firing. Hazards are launch motor blast, high noise levels, overpressure and debris. Personnel may not occupy this area.

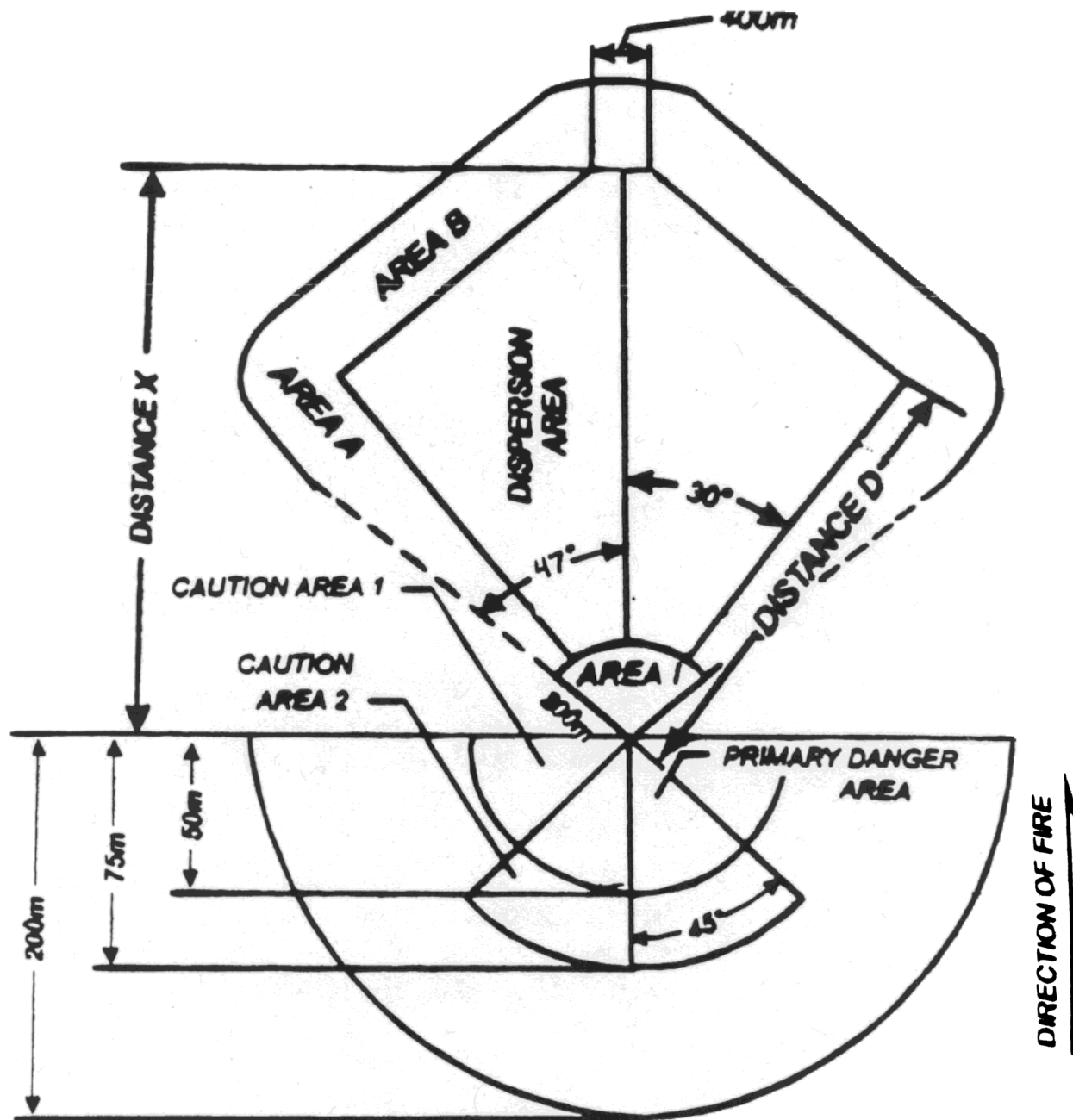
b. Caution Area 1 is an area extending 90 degrees either side of the gun target line for 50 m. Permanent ear damage could occur to personnel in this area during firing. Hearing protection is required by personnel occupying this area.

c. Caution Area 2 is an extension of the primary danger area with the same associated hazards and personnel protection required. The radius of this area is 75 m. Personnel may not occupy this area.

### Aerial Launch

For an aerial launch of a TOW missile 50 feet AGL and above a 90 degree either side of the gun target line 200 meter backblast zone must be used.

Surface danger zone for firing Basic TOW, Improved TOW,  
TOW2A and TOW 2B with 1:1,000 probability of escapement



C-8 A

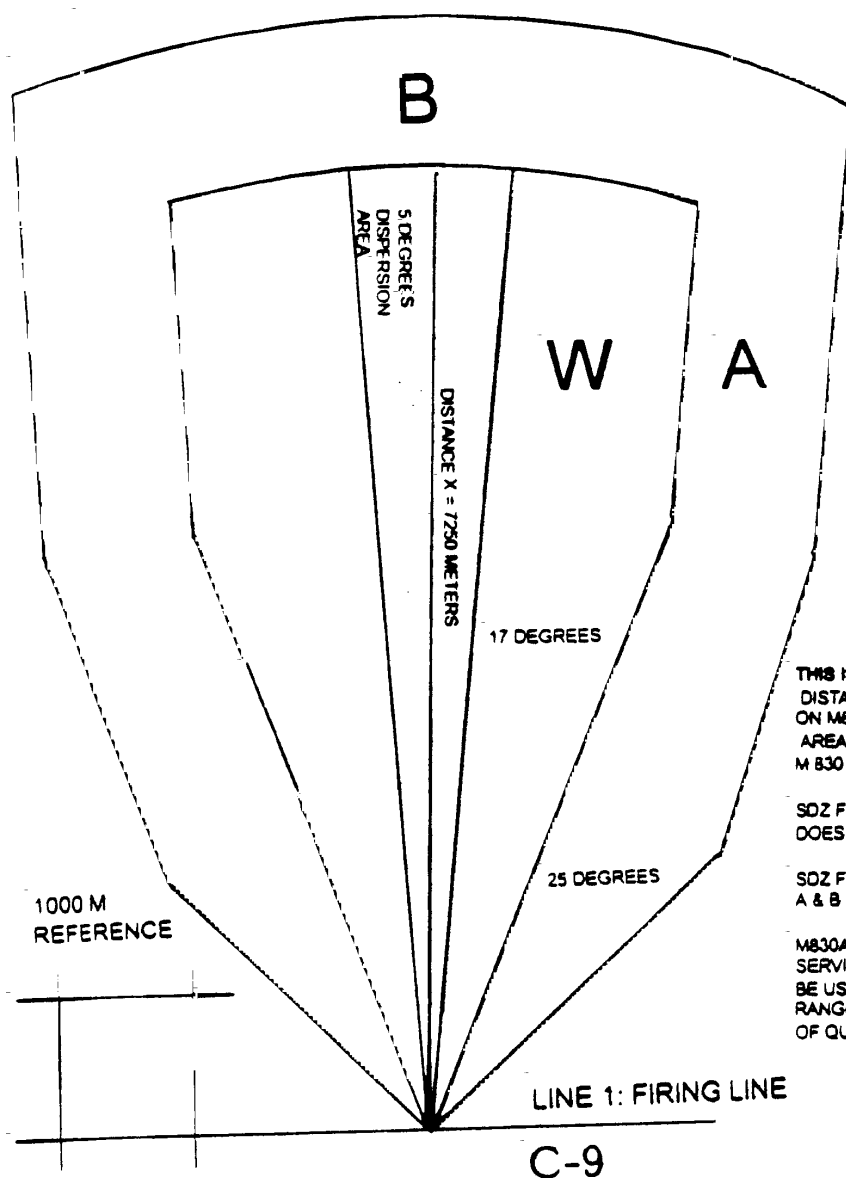
# M1A1 MAINGUN SINGLE TANK SDZ (COMPOUND M865 PIP/M830)

AREA W DANGER AREA FOR TANKS FORWARD OF LINE 1  
RICOCHET ZONE 1400 METERS

AREA A DANGER AREA FOR TRPS/VEHICLES FORWARD OF LINE 1  
LIVE HEAT BLAST ZONE 1125 METERS

AREA B DANGER AREA FOR TRP/VEHICLES FORWARD OF LINE 1  
LIVE HEAT BLAST ZONE 1125 METERS

DISTANCE X MAX RANGE OF ROUND AT 10 DEGREES QUADRANT ELEVATION  
M865 PIP = 7250 METERS



THIS IS A COMPOUND SDZ:  
DISTANCE X AND AREA W ARE COMPUTED  
ON M865 PIP DATA  
AREA A & B ARE COMPUTED ON  
M830 DATA.

SDZ FOR M831 (TRAINING HEAT)  
DOES NOT REQUIRE AREAS A & B

SDZ FOR M865 DOES NOT REQUIRE AREAS  
A & B

M830A1 SERVICE HEAT ROUNDS AND  
SERVICE SABOT MUST NOT  
BE USED DUE TO EXCESSIVE MAXIMUM  
RANGE AT 10 DEGREES  
OF QUADRANT ELEVATION.



DIMENSIONS FOR M-793, TP-T, 25 mm							
IMPACT MEDIA	AREA A METERS	AREA B METERS	AREA W <sup>1</sup> METERS	ANGLE Y Z DEGREES	DISTANCE X <sup>1</sup> METERS	RICOCHET RANGE METERS	15-DEGREE ELEVATION RANGE METERS
Armor	NA	NA	1,373	28 5	6,047	5,286	5,112
Concrete	NA	NA	1,290	27 5	6,047	5,071	5,112
Earth	NA	NA	908 <sup>2</sup>	19 5	6,047	4,792	5,112
Water	NA	NA	1,047	19 5	6,047	4,823	5,112

NOTES: 1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, use the 15-degree elevation range; except for armor impact medium, use ricochet range distance, whichever is greater. When firing on the move over rough terrain, use distance X.

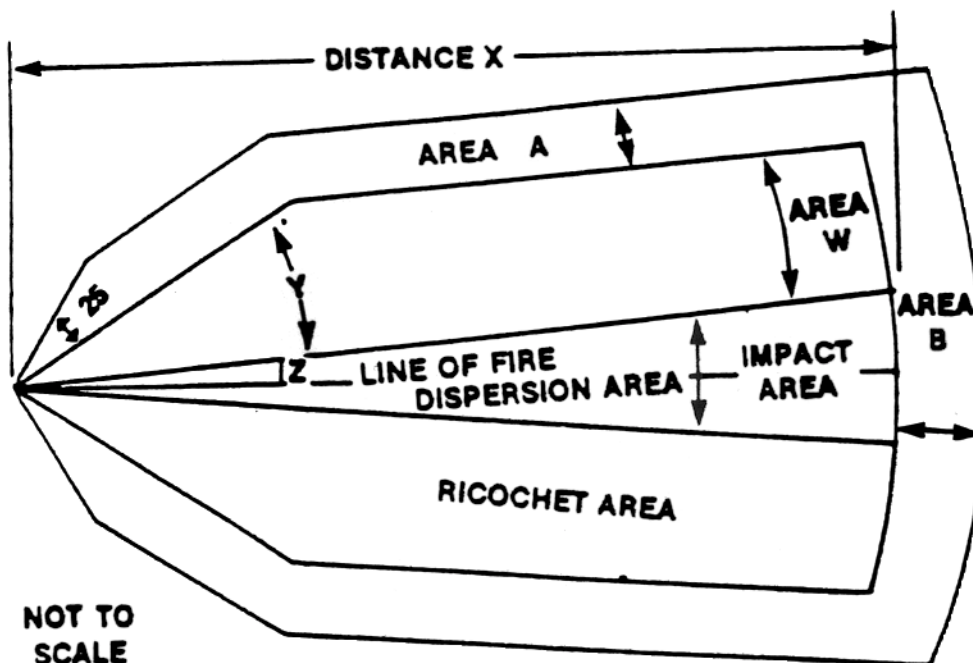
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by area W, and angle Y is not required.

3. Values listed for area W, angle Y, and ricochet range are the same as listed in the dimensions for M-792 since the M-792 HEI-T projectile is ballistically similar to the M-793, TP-T projectile.

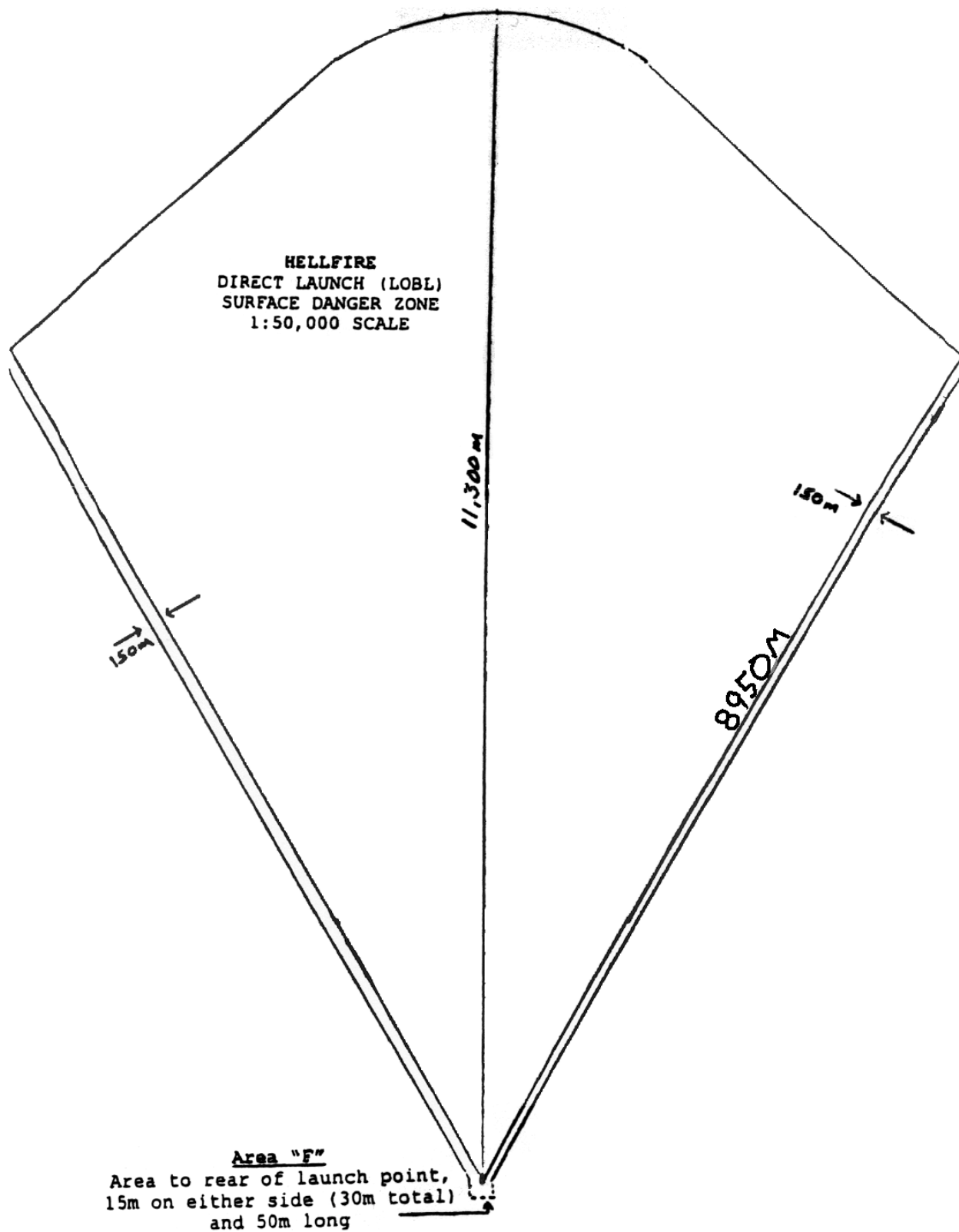
DIMENSIONS FOR M-792, HEI-T, 25 mm							
IMPACT MEDIA	AREA A METERS	AREA B METERS	AREA W <sup>1</sup> METERS	ANGLE Y Z DEGREES	DISTANCE X <sup>1</sup> METERS	RICOCHET RANGE METERS	15-DEGREE ELEVATION RANGE METERS
Armor	NA	NA	1,373	28 5	6,379	5,286	5,241
Concrete	NA	NA	1,290	27 5	6,379	5,071	5,241
Earth	NA	NA	908	19 5	6,379	4,792	5,241
Water	NA	NA	1,047	19 5	6,379	4,823	5,241

NOTES: 1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, use the 15-degree elevation range; except for armor impact medium, use ricochet range distance, whichever is greater. When firing on the move over rough terrain, use distance X.

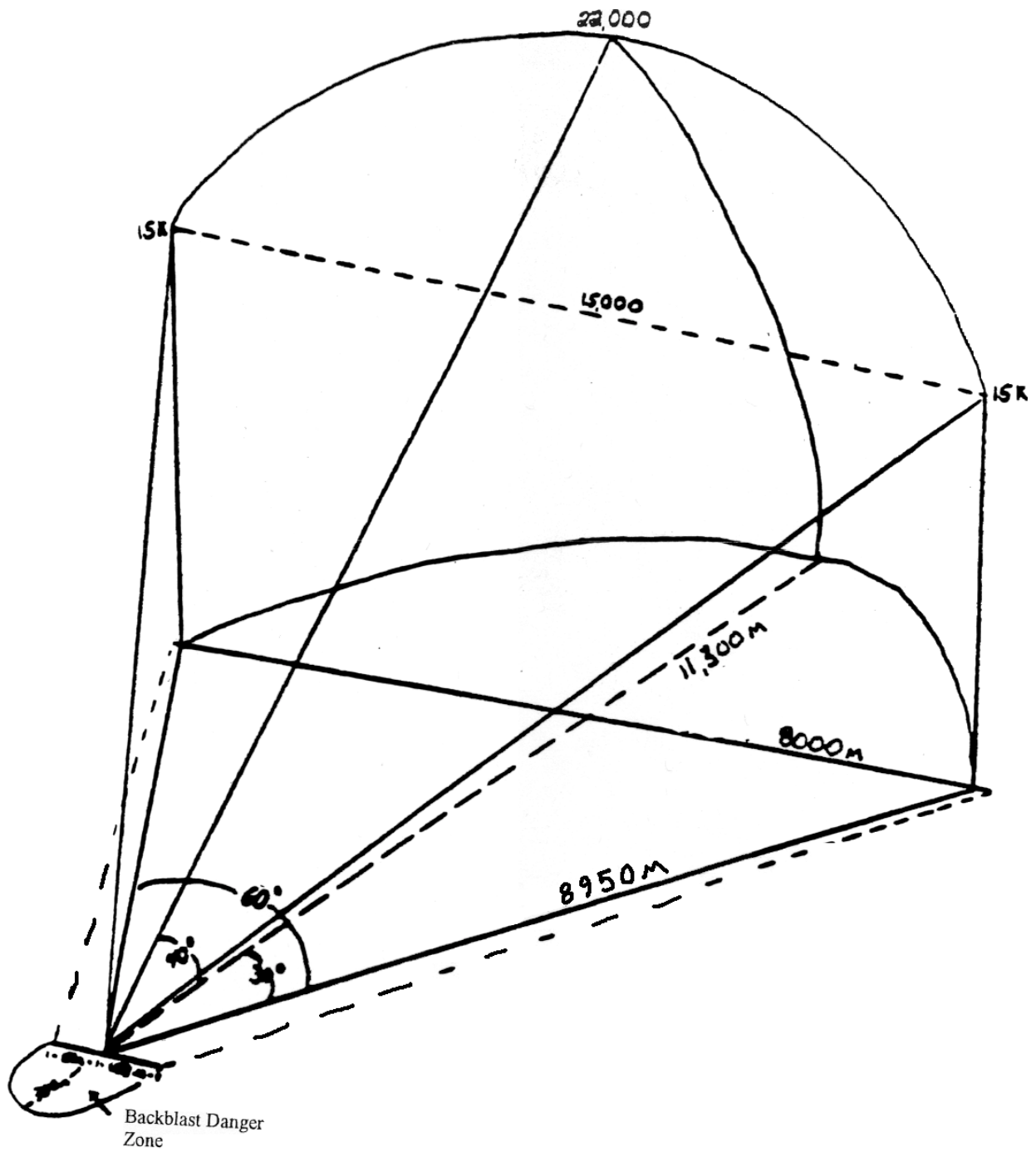
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by area W, and angle Y is not required.



Range Safety Fan for M-792 Ammunition.



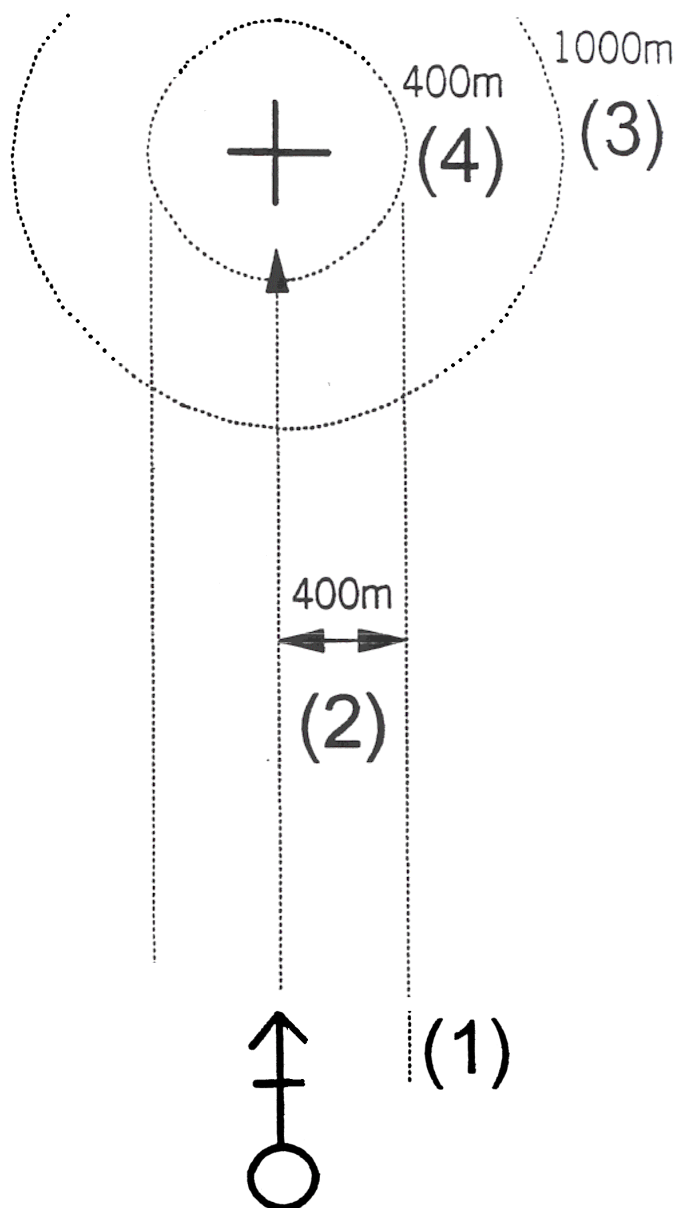
C-11A



Hellfire (Lock on Before Launch) Surface Danger Zone (SDZ)

C 11B

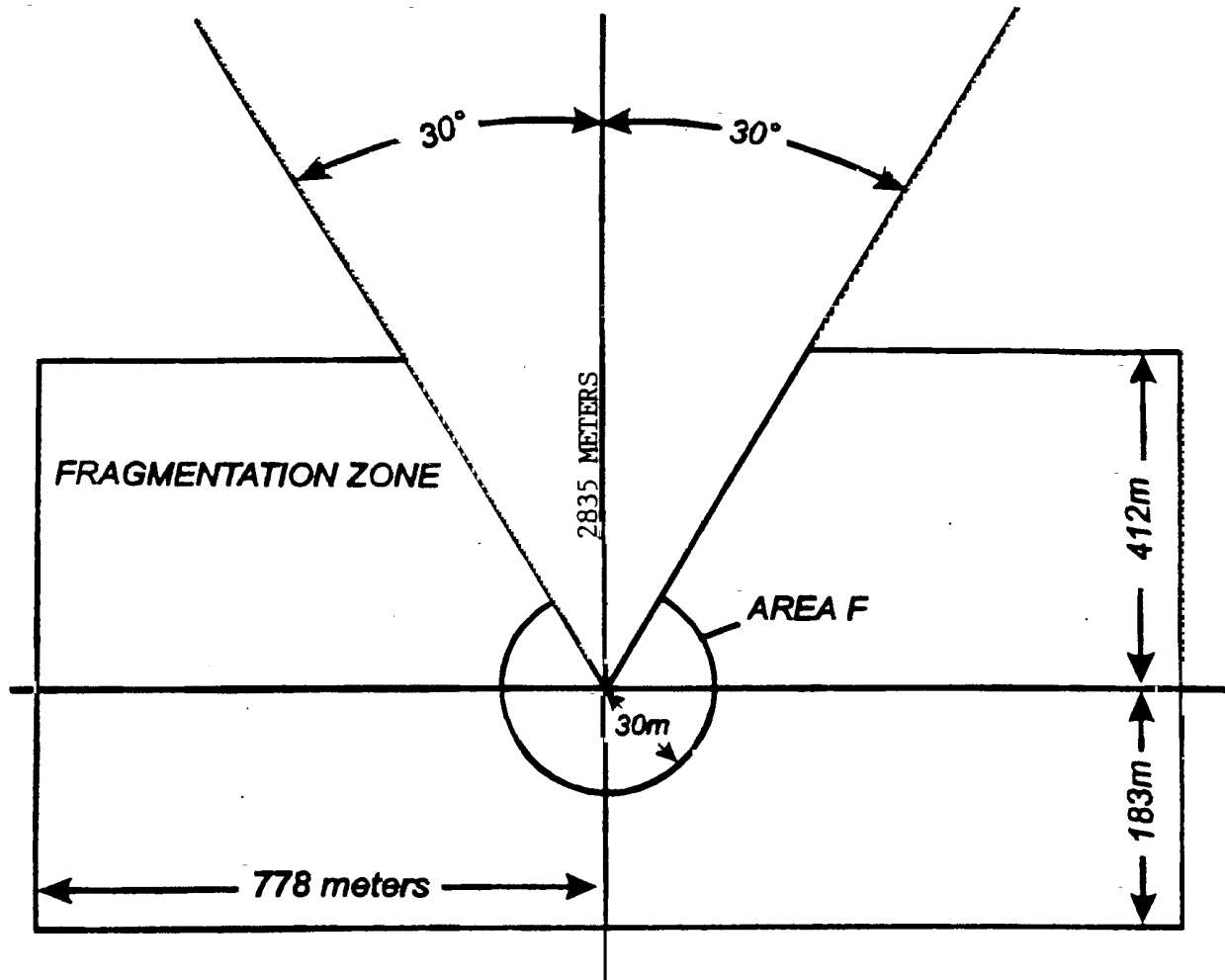
## MORTAR SAFETY DIAGRAM



- (1) Units cannot be within 400 meters of the gun-target line once forward of the mortar position.
- (2) The 400 meter separation is measured from the gun-target line.
- (3) The initial mission for all mortars must be at least 1000 meters from all personnel.
- (4) After two volleys from all tubes have been observed on target, the senior TEECG maneuver representative may clear maneuver forces to close within 400 meters of mortar impacts.

C-12

Surface danger zone, area F and fragmentation zone for firing mine clearing line charge with M58 high explosive charge



C-13

## **JAVELIN SURFACE DANGER ZONE**

The following SDZ is for the Javelin Missile when employed against fixed and moving targets. The size of Area A was conservatively selected to contain missile and warhead debris from impacts on the boundary and also contain portions of the missile that remain attached to the propulsion section, which may continue to be propelled until Flight Motor (FM) burnout. The SDZ parameters are as follows:

1. Area A is 500 meters wide for the HE warhead equipped rounds and 200 meters for inert warhead rounds from the launcher to a point 1000 meters downrange. At 1000 meters the flight motor is fully exhausted. The remaining downrange portion of area A is reduced down to a 200 meter width for HE warhead rounds and a 100 meters for inert warhead rounds at 4000 meters (Distance X).
2. Area B contains the debris scatter associated with missile landing at the forward edge of the impact area. This area measures 500 meters deep and approximately 6057 meters wide.
3. Area F is the danger area center on extending to the rear of the launcher. Area F consist of the Primary Zone, Caution Areas 1, 2, and 3.

### **Ground launch (Top Attack or Direct Attack)**

- a. The Primary Danger Area is a 60 degree angle (30 degrees either side of the rearward extension of the Missile To Line) with the apex at the aft end of the Missile launch motor. This zone has a 25 meter radius. Additionally, the Primary Zone is extended forward to the firing line from a distance of 1 to 5 meters left and right of the MTL. Personnel in this zone are subject to serious injury by activation of the flight motor pressure relief system. Personnel may not occupy this area.
- b. Caution Area 1 is an extension of the 25 meter Primary Danger Zone arc forward to the firing line on each side of the launcher. Serious hearing impairment or damage from frequent exposure could occur to personnel in this area during firings. Personnel in this area must wear approved hearing protection devices and eye protection.
- c. Caution Area 2 is an extension to the rear of the Primary Zone 10 meters beyond the primary danger zone. Serious hearing impairment and eye damage could occur to personnel in Area 2 during firings. Personnel in this area must wear approved hearing protection devices and eye protection.
- d. Caution Area 3 is an extension to the rear of the Primary Danger Zone within the 60 degree sector with a 100 meter radius. This area is affected by the activation of the flight motor pressure relief system. Personnel in this area will wear eye protection.

**C - 14**

- ALL DIMENSIONS IN METERS
- NOT TO SCALE
- +/- 45 DEGREES REPRESENTS 1E-6 PROBABILITY BOUNDARY - CURRENT SOFTWARE
- +/- 30 DEGREES REPRESENTS 1E-5 PROBABILITY BOUNDARY - " "
- +/- 16 DEGREES REPRESENTS 1E-4 PROBABILITY BOUNDARY - " "

AREA A:	LIVE	INERT
X =	1000	1000
Y1 =	500	200
Y2 =	200	100

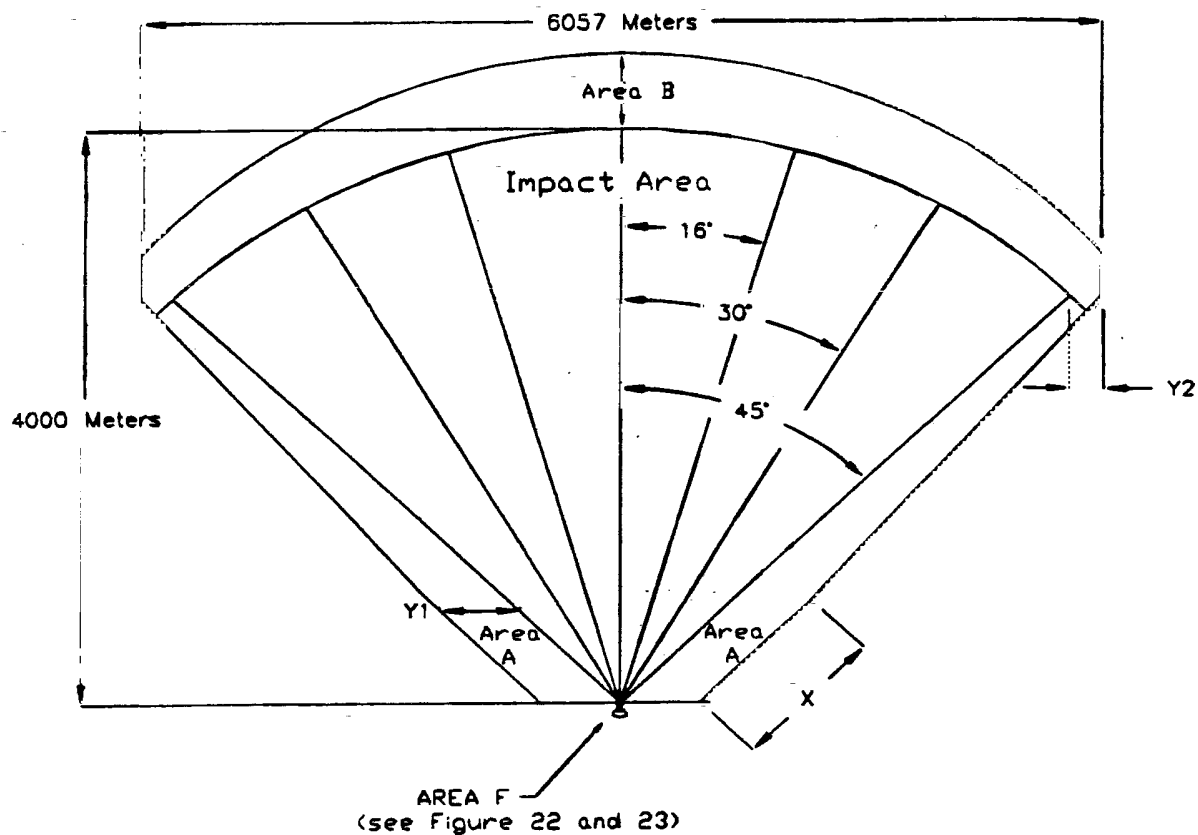
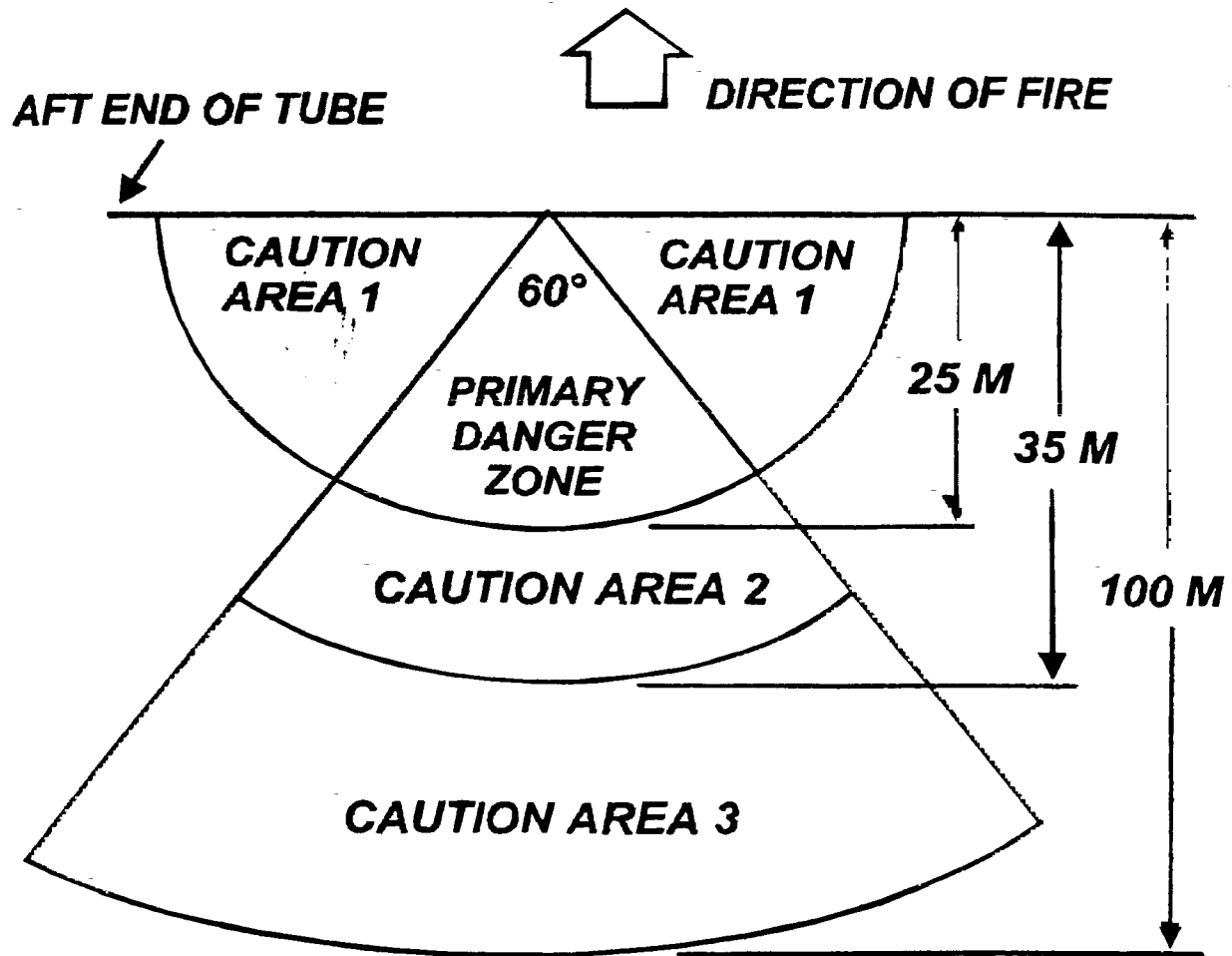


FIGURE 1. JAVELIN Surface Danger Area – 8.04 Software

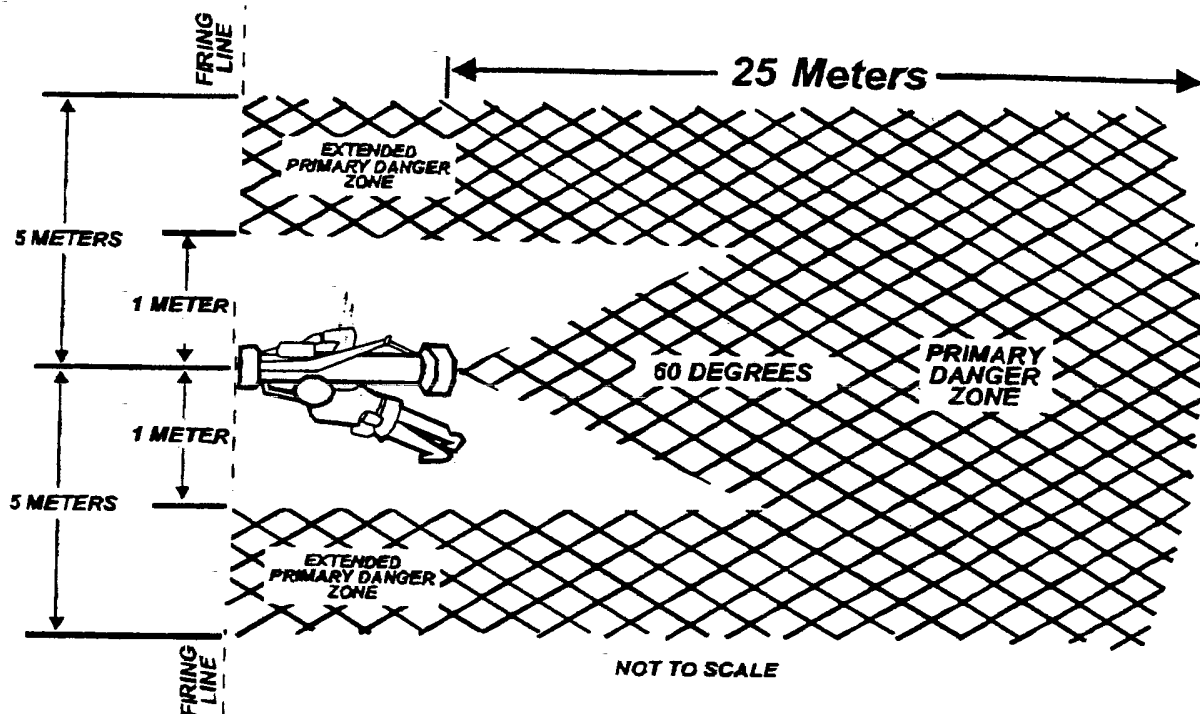
Surface danger (Area F) for JAVELIN missiles



C - 14B



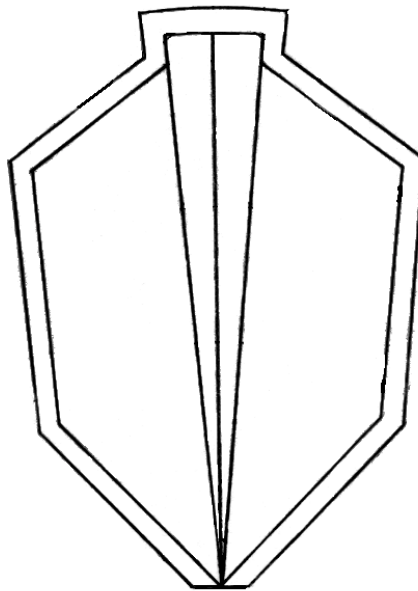
Primary danger zone (Area F) extension for activation  
of JAVELIN missile flight motor pressure relief system



C - 14C

20mm SDZ	
Distance X =	4500m M55A2 TP
Distance Y =	4240m M56A3 HEI
Area W =	1220m M56A3 HEI
Angle P =	39 deg M56A3 HEI
Angle Q =	58 deg M56A3 HEI
Vert Hazard =	664m M56A3 HEI
Area A =	160m M56A3 HEI
Area B =	160m M56A3 HEI

1:50,000



C-15

## APPENDIX D

### RSO INFORMATION

DESCRIPTION	PAGE
I. ROAD GUARD, FIRING UNIT, AND RSO LOCATIONS	D-1
II. RSO CHECK LIST	D-2 / 3
III. RSO INFORMATION	D-4

**ROAD GUARD, FIRING UNIT, AND RSO LOCATIONS**

<b>EVENT</b>	<b>BTRY</b>	<b>81MM</b>	<b>RD. GD**</b>	<b>RSO/MISC.**</b>
<b>ASCEX</b> and <b>FSCEX I</b>	NU7107	NU677096 TACTICAL SCENARIO	NU668090 NU728115 NU739088	OP LEFT
<b>LARSC</b>  and  <b>MAC</b>	NU8506  NU8895 (SE TO MSR; FORWARD OF LD)	TACTICAL SCENARIO	NT898928 NU910125 NU732113 NU772047 NU940088	CRAMPTON  (LARSC only NFA NU821065)
<b>HAC</b>	NU7312	TACTICAL  SCENARIO	NT898928 NU919093 NU732113 NU772047	CRAMPTON
<b>FSECX II</b> and <b>FSCEX III</b> Quackenbush	TACTICAL SCENARIO	TACTICAL SCENARIO	NU696050 NU742087 NU732110 NU638048 NU612050	LD:672090 PLZ:6707 LZ:604137
<b>FSCEX II</b> and <b>FSCEX III</b> Black Top	TACTICAL SCENARIO	TACTICAL SCENARIO	NU732110 NU772048 NU869001 NU913093	LD021167 PLZ:PU0316 LZ:914147
<b>FINEX</b> Quackenbush	TACTICAL SCENARIO	TACTICAL SCENARIO	same as FSCEX II/III (Quackenbush) with 2 exceptions on DAY 3 only: 1) ADD NU873015 2) MOVE NU612050 to NU772048	OP LEFT NU670090
<b>FINEX</b> Black Top	TACTIAL SCENARIO	TACTICAL SCENARIO	same as FSCEX II/III (Black Top) with 2 exceptions on DAY 3 only: 1) ADD NU668090 2) MOVE NU732113 to NU742087	NOBLE OR CRAMPTON

**\*\*Road guard locations are mandatory. Road Guards must be employed in Pairs with OE254 antenna and be provided overhead cover (i.e. camouflage netting). RSO and firing unit locations are recommended.**

## RANGE SAFETY OFFICER CHECKLIST (TTECG EVENTS)

### 1. PREPARATION

\_\_\_\_\_ Identify RSO for each event:

EVENT	RSO	UNIT
ASCEX I & II		
ASCEX III		
FSCEX I		
FSCEX II		
FSCEX III		
LARSC		
MAC		
HAC		
FINEX		

\_\_\_\_\_ All RSO's attend informal TTECG RSO safety Brief with TTECG Artillery Rep. on DAY 1 of CAX.

\_\_\_\_\_ Forty-eight (48) hours prior to your event:

Identify participating units and personnel.  
Confirm helicopter sweep of designated training area has been scheduled.  
Coordinate road guard support (two Marines per position) and identify proper placement.

\_\_\_\_\_ Required equipment:

RSO: 2 PRC 119 radios with OE254 antenna groups  
1 radio will be on 49.85 (Bearmat)  
1 radio will be on 40.65 (Exercise Safety Net)  
(A vehicle mounted radio is recommended for all events. It will be required for the MAC/HAC/ LARSC cycle and FINEX.)

Roadguards:  
2 PRC 119 radios (Freq... 40.65 Exercise Safety Net)  
5 gallon water can  
Rations  
Overhead cover

Participating Units:  
1 PRC 119 radio (Freq. 40.65 Exercise Safety Net)

## 2. EXECUTION

\_\_\_\_\_ On the afternoon PRIOR to designated event.

RSO in position.

Roadguards in place.

Communications established between RSO and Roadguards. (Freq. 40.65)

\_\_\_\_\_ On the MORNING of the designated event:

Ensure positive communications with Roadguards. (Freq. 40.65)

Establish positive communications with BEARMAT (Freq. 49.85)

Establish positive communications with all participating units. (Freq. 40.65)

Collect and collate information required by BEARMAT to go hot.

Submit all information to BEARMAT and DASC (Freq. 49.85) as soon as possible.

Inform BEARMAT the status on the Range Sweep. If range sweep has not been completed inform BEARMAT "Awaiting range sweep" and contact BEARMAT as soon as sweep has been completed.

Once "Cleared Hot" by BEARMAT inform all participating units.

\_\_\_\_\_ During execution:

Maintain positive communications with BEARMAT (Freq. 49.85).

Maintain hourly radio checks with units and road guards (Freq. 40.65).

## RSO REQUIRED INFORMATION

Name of TTECG event: \_\_\_\_\_

Training Area(s) listed in CAX Bulletin

Impact area used "Bordered by 1000 meters"

Range Sweep status

Participating Units:

Unit	Grid Location		Weapons Fired	Types of Munitions: HE, WP, RP, SMK, etc.	Medical Personnel

NOTES: